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THE LARYNGOSCOPE

AN INTERNATIONAL MONTHLY JOURNAL
DEVOTED TO DISEASES OF THE

EAR - NOSE - THROAT

FOUNDED IN 1894 BY

DR. M. A. GOLDSTEIN, St. Louis,

Managing Editor and Publisher.

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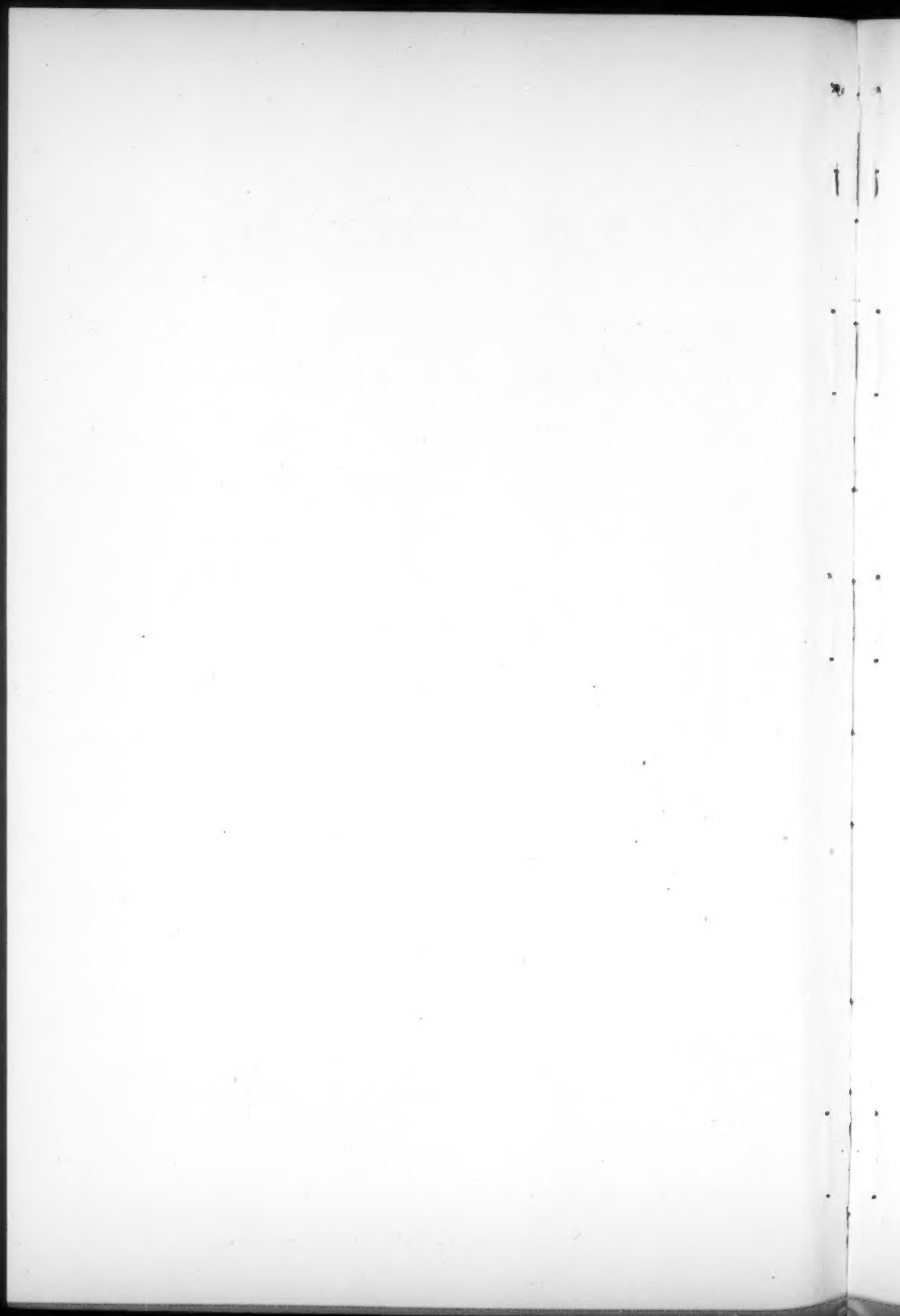
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In Appreciation

With this issue The Laryngoscope completes its 25th year of uninterrupted monthly publication and its editor takes this unusual occasion to express his appreciation to collaborators, contributors, subscribers, fellow-journalists, friends, advertising patrons, — all who have been instrumental in its development and progress.

The path of editorial conduct and business management of a medical journal is neither smooth nor strewn with roses. Personal differences, editorial jealousies and contentions, medical politics, financial stringencies, contributors' eccentricities, ethical exactitudes and many other handicaps must be met in dignified and decisive manner and an editorial management that can run this gauntlet successfully

must exhibit strength of conviction and faithfulness to ideals.

A chain is as strong as its weakest link and the literary strength of a medical journal is no exception to this axiom, for its scientific quality is as strong as its weakest contributor.

The splendid development of American Oto-Laryngology in the last quarter of a century has been the back-bone of our journal's dignified growth, and we acknowledge our profound obligation to this vital stimulus.

We have weathered many storms, even that of the World's War, which, in its relentlessness and destructiveness has terminated the career of a number of worthy Oto-Laryngological journals, has left The Laryngoscope unscathed and unhindered in its mission of literary and scientific usefulness.

It has always been our ambition

to strive for the highest ideals in American oto-laryngology and toward this accomplishment we face the second quarter-century with less trepidation than we did the first turbulent years of our career.

It must be a matter of satisfaction to our many contributors to note the confidence, respect and frequency with which their best efforts are abstracted and quoted in medical journals throughout the world and by such recognition establish the prestige and value of their scientific accomplishments.

Oto-laryngology has grown into a formidable and dignified specialty and we must strive to raise it to even higher and loftier standards.

The time has come for American specialties in medical and surgical

science to blend with American scientific material and American labor.

"Made in America" must be the slogan in the training of our specialists of the future. Our clinic teaching strength stands high; our laboratories for fundamental training and research work in oto-laryngology must follow suit. If journalistic influence and an organ of literary record can assist in the development of such accomplishments, The Laryngoscope stands ready to give its best to this cause.

Cooperation is the secret of success and your loyal support has made The Laryngoscope what it is.

With feelings of sincere appreciation to all friends for their kindly interest and allegiance

I am, very sincerely,

Max A. Goldstein.

Editor

St. Louis, July 1st 1921.

MODERN LABYRINTHOLOGY.

PROFESSOR ROBERT BARANY, Upsala, Sweden.

- I. Arrest of Nystagmus by Closing of the Eyes.
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I. Arrest of Nystagmus by Closing of the Eyes.—My former assistant, Dr. Vilhelm Nasiell, in 1919 determined the following fact and discussed it in part at the session of the Otological Section in Stockholm, November 29, 1919: If a rotary or caloric vestibular nystagmus of selected character and strength has been determined, such nystagmus can be made to disappear by intense closure of the eyelids. The eyes assume the same position during the closure of the lids as before or after the vestibular nystagmus is produced. If the closure of the eyes is not intense enough and if the nystagmus is a marked one, this act may not completely check the nystagmus. If the closure of the lids is interrupted the vestibular nystagmus must be regarded in the same manner as before the closure of the lids and its duration will be shortened in proportion to the continuance of the closing of the lids. We have under consideration here the arresting of a vestibular nystagmus by closure of the lids and also spontaneous nystagmus of various types are arrested by closure of the lids. The publication of this research by Dr. Nasiell has been unavoidably delayed, but will be published shortly in the "Acta Oto-Laryngologica," under the caption, "The Arrest of Spontaneous and Experimentally Incited Nystagmus by Fixation and Closure of the Lids" (elaborated in an address before the Otiatric Section of the Swedish Society of Physicians, November 29, 1919).

A few days ago Dr. A. Pekelsky¹ sent me a Czechic "Arbeit," in

which he independently arrived at the same conclusions, as I gather from the German translation of this contribution. Unfortunately this translation is but a short abstract, so that I cannot discuss it extensively and do not know what explanation he offers for this observation. The question that presents itself is: How is this arrest of nystagmus explainable?

We must consider more closely Bell's phenomenon on the one hand and the observation of arrested nystagmus on the other. Bell's phenomenon consists of the observation that the eyes are rolled upward during intense closure of the lids. Frequently a divergence of the eye is noticed. As suggested by Dr. E. A. Tracy² (Boston) this ocular position is indicated by two lines. The usual position is as follows $\backslash /$, occasionally there is a divergence of but one eye, the other remaining in median position $\backslash |$ or $| /$. In the large majority of subjects the eyes are directed upward, yet occasionally cases are found in which the eyes are directed downward. As a rule the eyes remain at rest behind the closed lids but in some instances there is an uninterrupted to-and-fro movement. A not infrequent phenomenon is the oscillating nystagmus of Stransky.³ The eyes are brought into a very rapid, short-stroked tremor of horizontal direction. Both movements are very rapid and of similar speed. To examine the eyes back of the closed lids the thumb must pull the upper lids upward while the patient is in the act of forcibly closing the lids. A view of the lower rim of the iris is sufficient to determine the position of the eyes when they are directed upwards. To determine Bell's phenomenon, the following observation which I have made may be of some importance. (I am not aware that this observation has been made elsewhere.) I found that acquired or congenital abducens paralysis of one eye does not exclude the fact that this eye diverges outward by closure of the lids, assuming the position $\backslash /$. I have even observed convergent strabismus occasionally transformed to divergent during closure of the lids. As a rule, however, the converging eye is turned inward and upward.

The phenomenon that the eye is directed upward and outward in spite of abducens paralysis may be explained as follows: the position of the eye in a direction outward must, at least in these cases, be a pure, mechanical one, controlled by the ligament apparatus and not by muscle contraction. We must not, therefore conclude, without further consideration, that the position $\backslash /$ is due to an innervation of both abducens.

The following is certain: On closure of the lids the eyes roll upward. The rectus superior and obliquus inferior muscles are, there-

fore, simultaneously innervated. In some cases, however, the rectus inferior and obliquus superior are innervated. In those cases in which the eyes oscillate to-and-fro behind closed lids the rectus internus and rectus externus must also be innervated; this must also be accepted in those cases of associated nystagmus of Stransky. Here a very intense alternating innervation of the rectus externus and rectus internus must take place. It is Dr. Nasiell's and my opinion that in closure of the lids, all eye muscles are intensely innervated and the more intense the lid closure, the more intense the innervation and the arrest of the vestibular nystagmus depends on the simultaneous innervation of agonistic and antagonistic innervation and the consequent blocking of these opposing muscles. This arrest we consider as a purely peripheral, mechanical check. The observed phenomenon may all be explained on this basis. Divergence in the norm may be explained by the fact that notwithstanding the fact that the rectus internus is a stronger muscle than the rectus externus, the divergence position occurs as a result of simultaneous action of the ligament apparatus of the eye.

II. Arrest of Rotary Vestibular Nystagmus by Convergence.—Another observation which I have made corroborates the explanation of arrested nystagmus due to simultaneous contraction of the agonistic and antagonistic muscles. I have observed that during very intense convergence an intense rotary nystagmus may be completely checked, but a vertical nystagmus remains unaffected. This observation I have made in two normal cases with intense convergence. The explanation for this is as follows: If the rotary nystagmus can be determined it is produced by the turning inwards of the eye, due mainly to the action of the recti superior and inferior muscles, while a vertical nystagmus is almost exclusively due to the action of the obliquus. In maximal convergence not only the rectus internus but also the rectus superior and rectus inferior come into action, and these also have a slight convergence influence by their simultaneous innervation, thus causing the rotary nystagmus to be checked; the vertical nystagmus, however, uninfluenced by the recti superior and inferior, remains unchanged.

Here also we have a peripheral mechanical arrest of vestibular nystagmus due to simultaneous innervation of the agonistic and antagonistic muscles.

III. Observations on the Position of the Eyes During Sleep.—Many text-books offer the statement that the eyes are rolled upwards during sleep. This is a fallacy. The rolling upwards only occurs during intense closure of the lids. During sleep, where the lids are

closed, but apparently relaxed, the eyes are not rolled upwards, as I have convinced myself in an examination of numerous cases. The eyes are in a position almost directly forward, sometimes slightly downward or upward, but a marked rolling upward is never present. If the lids are clumsily lifted, naturally a reflex results, followed by an upward rolling of the eye. If the lids are carefully lifted, however, so that the subject is not disturbed, the eyes will never be found in an intense upward position.

IV. Deviation of the Eyes When Eyelids Are Closed.—Whether a deviation of the eyes takes place in the normal subject when eyelids are closed I do not know. I have never yet seen a case in a definitely normal subject. I have, however, determined the deviation of the eyes with closed lids in three diseased conditions, namely (1) Destruction of the labyrinth, (2) Hemiplegia, (3) Epilepsy.

(1) But few observations have been made as yet by me and Nasiell concerning deviation of the eyes with closed lids in labyrinth destruction. I have reported this observation, January 29, 1921, at the Otological Section in Stockholm. From theoretical considerations I arrived at the conclusion that in labyrinth destruction such a deviation of the eyes to the affected side must take place, and my observations have been corroborated. Frequently as early as the second or third day following labyrinth destruction the deviation of the eyes with lids closed takes place. In a large group of cases I have found this deviation present long after the spontaneous nystagmus had disappeared. This deviation is not always present. It is, therefore, not a constant symptom of latent labyrinth destruction, but is found in the majority of such cases. This deviation is analogous to the head-twisting of pigeons and the head and eye distortion in rabbits. It apparently occurs as the result of a contraction of the muscles following the vestibular permanent impulse. Evidently the nystagmus results from two innervations: the slow in one direction, and the rapid in the other. During sleep, however, the rapid component is eliminated, while the slow innervation continues. Presumably this deviation is developed during sleep. I have not yet had opportunity to observe whether this deviation actually occurs "over night."

(2) In 1913, I first described latent deviation of the eyes in hemiplegia to the affected side.⁴ In referring to this publication I wish to remark that Prezzolini,⁵ in Bologna, has also independently made this observation. He even presented this observation before I did, but published his data later. This deviation occurs simultaneously with the disappearance of the cortical or subcortical conjugate ocu-

lar paralysis to the side of the paralyzed muscles and proves that one-sided subcortical or cortical ocular paralyses are never found in long-standing cases. This is my explanation for the apparent "cure" of conjugate ocular paralysis that also occurs in *ad exitum* cases and not the existence of completely hypothetic centers for the movement toward the same side in the healthy hemisphere.

(3) In epilepsy also I have frequently found deviation of the eyes with closed lids. It is my opinion that this is a sign of a cerebral focus. Possibly we are dealing with a focus in the frontal oculomotor center, which produces a conjugate ocular paralysis and consequent deviation of the eyes to the opposite side simultaneous with "cure" of the conjugate ocular paralysis.

V. Rocking Vestibular Eye Movement Synchronous With the Pulse; Peripheral (Ausgelöster); Labyrinth Tonus.—In 1906⁶ I first described the observation that in a patient with labyrinth fistula and otherwise intact labyrinth a constant, slow rocking, horizontal-rotary movement of the eye was noticed. I and others⁷ have repeatedly observed this phenomena and that mostly in cases of labyrinth fistula with intact labyrinth. In November, 1916, I found it in a case of lues withluetice disease of the right internal ear. This case was also observed by my former assistant, Dr. Martha Pson Hening. She promptly expressed the opinion that this movement might be synchronous with the pulse. An examination of the pulse corroborated the accuracy of this opinion. Since then I have seen innumerable cases and always found this synchronicity of the slow eye movement with the pulse; on the other hand, I have never found synchronicity of the nystagmus component with the pulse.

The synchronicity of this slow eye movement with the pulse results from the fact that the first slow ocular movement occurs simultaneous with the pulse wave and that the second, opposing ocular movement, occurs distinctly after the pulse wave has passed. Neither Dr. Hening nor I have published this observation of the simultaneous occurrence of the slow ocular movement with the pulse. In March, 1918, S. H. Mygind published an article in the *Zeitschrift für Ohrenheilkunde*, Vol. 77, page 70, under the caption, "A New Labyrinth Fistula Symptom," wherein he reports two cases of labyrinth fistula in which he determines the synchronicity of the slow ocular movement with that of the pulse. Mygind naturally developed his observations entirely independent of ours and the priority of publication is due him, yet Dr. Hening is entitled to the priority of observation. Her observations followed my written report, November 27, 1916. Mygind made his observations in December, 1916.

What are the requisite conditions for the occurrence of this rocking, slow ocular movement with that of the pulse? (1) The first condition is hyperemia, that is dilatation of labyrinth vessels that are usually small or the presence of abnormally dilated vessels in a pathological tissue of the labyrinth. (2) Ready stimulation of the nerve endings in the labyrinth. (3) Ready stimulation of the centrum in the medulla. (4) A condition which I do not consider it necessary, but favorable, namely, the presence of a fistula or an abnormally weak point in the labyrinth wall. (5) Favorable also is an increased sensibility in the centrum in the medulla. (6) Not necessary is a free circulation of the endolymph.

(1) Mygind is, as far as I can see, of the opinion that the slow ocular movement with the pulse is dependent on an inflammatory granulation tissue in the labyrinth. However, I have seen this same slow eye movement in a healthy labyrinth several minutes after the injury has taken place and after the patient has vomited. This at least proves that an abnormal tissue in the labyrinth is not a necessary condition. I am of the opinion that a hyperemia of the labyrinth is one of the necessary conditions. Dr. Joseph Breuer, the father of the Breuer-Machschen theory, with whom I have corresponded on this subject, believes that the abundant vascular supply of the crista might very well be stimulated with every pulse wave and by this means develop a movement of the endolymph. I believe this to be a very happy thought. In this consideration I do not wish to state that the presence of granulations in the labyrinth is an immaterial thing. On the contrary, it is possible that in most cases of labyrinth fistula which are spontaneously developed, the pulsation in this granulation tissue develops this symptom.

(2) If the nerve-end spots of a labyrinth are reduced, nystagmus ensues on the healthy side. We do not yet know the cause of nystagmus or nystagmus attacks directed to the affected side. At all events, the presence of a marked nystagmus to one or the other direction is not co-related to slow ocular movement. Slight nystagmus to right or left with lateral glance occurs frequently. It is certain that this slow to-and-fro movement is due to two slow phases of nystagmus directed to right or left, as I have reported in my first description of same in the *Monatschrift für Ohrenheilkunde*, 1906, and as Ruttin has especially emphasized. We can artificially produce an analogous condition in the normal by constant switching of the poles of a selected degree of galvanic current so that a slow movement and not a nystagmus is produced by the galvanic current. It is well known that in labyrinth fistula this type of slow movement

rather than the nystagmus can be demonstrated (Ewald, Högyes).⁸ The stimulus that provokes this movement is in all instances a slight one. The nerve-end spots must therefore be easily excitable in order to react to such slight stimuli.

(3) There are rare cases in which the nerve-end spots of the labyrinth are excitable, even though the vestibular neuro-cells of the medulla oblongata are but slightly or not at all excitable. How can this be diagnosed? The diagnosis may be made if the equilibrium disturbance, the pointing reaction or the turning test produces an intense reaction on vestibular irritation while the nystagmus is either very weak or entirely absent. I have observed four cases⁹ of this character and one has been reported in literature.¹⁰ The first of my cases was diagnosed and operated for acousticus tumor. At the time of the operation, however, no tumor was found. I saw the patient after the operation. He was deaf on the operated ear, had no caloric reaction as far as nystagmus was concerned, but had a very distinct pointing and falling reaction. I promptly diagnosed this as an intramedullary process and this was substantiated at the post-mortem.¹¹

In the Austrian Otological Society, O. Beck reported a case of hereditary syphilis in which there was absolutely no nystagmus on turning.¹² I tested the patient for pointing reaction after turning and found that this was very pronounced, notwithstanding the absence of nystagmus. From this we are justified in the conclusion that this disturbance, in which an absence of rotary nystagmus was found, was not located in the labyrinth, but in the medulla oblongata.¹³ I will not here elaborate the other cases which I have observed. In reference to these cases I claim that, while not essential, but found in nearly all cases, the normal excitability of the nerve cells in the medulla is an essential condition.

(4) Rocking ocular movement has until now been observed almost exclusively in labyrinth fistula. My claim may therefore cause some surprise if I contend that a fistula is not always necessary, but may be regarded only as a favorable condition. I take this position as the result of my observations. I have recently observed a case of lues of six months' standing in a 22-year-old officer, who had a right labyrinthitis and in the early days of my observations showed a weak reversed fistula symptom when tested in the right external auditory canal (only slow, slight ocular movement by compression and aspiration) and this spontaneous slow ocular movement with the pulse. Within eight days after iodine medication the fistula symptom disappeared completely by compres-

sion and aspiration test, but the slow, spontaneous ocular movement synchronous with the pulse persisted. This patient exhibited an intact drum membrane and a distinct reddening of the promontory, Weber was lateralized to the healthy side, Rinne was positive, and bone conduction was shortened on the diseased side. Caloric reaction was entirely absent on the diseased side. I wish to observe that I considered the absence of caloric reaction as a disturbance in the movement of the endolymph and not as an injury to the nerve-end spots. Vertigo occurred in this case fourteen days prior to the first examination. This had later increased in intensity and toward the conclusion of my observations and the administration of iodine had again been markedly reduced. I believe that in this case a disease of the labyrinth in the region of the stapes should be considered in which a distinct loosening of the stapes had not yet developed, for the Hennebert symptom was but slightly demonstrable. On pressure no nystagmus but a slow ocular movement of limited compass occurred. This disappeared again following iodine medication. Apparently this process was rapidly checked. Notwithstanding this, however, there was at this time distinct rocking ocular movement. Here the membrane of the round window must have served as a vent—and why not? Of course, this case is one of rarity. Ordinarily a disease of the labyrinth of this character may only be determined by labyrinth fistula. In such a rapid injury of the nerve-end spots may ensue. From a theoretical point of view this one case, however, is sufficient evidence for the fact that the existence of a fistula or an abnormal vulnerability at a site in the labyrinth is not an essential condition for the occurrence of a rocking ocular movement.

(5) It is self-evident that a hypersensitivity of the nerve centrum in the medulla must be a favorable factor, just as is the reduced sensitivity a prevention of this symptom. This hypersensitivity may be diagnosed if vertigo attacks occur during movements of the head caused either by stimulation of the semicircular canal apparatus or, as I have recently described, in the otolith apparatus.¹¹ This hypersensitivity may also be disclosed during abnormally intense caloric or turning reaction or by an increased value in counter-rotation.

(6) A free circulation of the endolymph is not a necessary condition of the slow ocular movement as proven by the observation of the luetic case in which the caloric reaction was absent. In the majority of cases of labyrinth fistula the caloric reaction is normal, so that changes of this character may also easily lead to injury to the nerve-end spots.

I have discussed in the preceding paragraphs the conditions necessary for the development of the slow ocular movement; let us now consider the explanation of this phenomenon. It seems certain that this is due, as Mygind observed, to the to-and-fro movement of the endolymph and that this movement is brought about by the congestion or depletion of the vessels in the labyrinth. It may be assumed that the endolymph is directed toward the vent (ausweichstelle) during systole and away from it during diastole. Whether this vent is at the point of the fistula or of the round window cannot be theoretically determined. If no obstruction to the movement of the endolymph takes place we may assume that it is the fistula. Where there is obstruction to this endolymph movement we cannot determine this in advance.

As the result of this observation I think the hypothesis of Shambaugh,¹⁵ advanced some years ago, may be realized, namely, that the pulse wave in the normal subject influences the endolymph in a to-and-from motion and thereby establishes the tonus of the vestibular apparatus from the periphery. Apparently these movements are so slight, due to the small calibre of the normal vessels, that they do not produce a slow ocular movement in the normal subject, nevertheless I think it might be possible to maintain tonus of the vestibular apparatus from the periphery with even such a slight stimulation. In the presence of hyperemia of the labyrinth these movements naturally are more marked and then set up this rocking ocular movement. The presence of a peripheral labyrinth tonus (Shambaugh) does not indicate, as I would observe in passing, a coexistent central tonus of the nerve cells.

VI. Vasomotor Phenomenon in the Vestibular Apparatus in Lucs and Labyrinth Fistula. (S. H. Mygind.)—The observation of this vasomotor phenomenon leads us to a series of other vasomotor conditions in the vestibular apparatus. On June 13, 1911, I demonstrated in a patient at the Neurological Society in Vienna¹⁶ the following findings: Six months before his presentation the patient had sustained an accident caused by the falling of a pair of heavy pliers on the left ear. The usual symptoms in this case are inconsequential and I simply wish to emphasize the following: One day the patient came to me with the very unusual report that he had a violent vertigo when he wore a collar and turned his head to the left. I had him go through this movement and immediately a violent nystagmus took place to the right (rotary plus horizontal). I examined him carefully and found on firm pressure at a point between the mastoid process and the lower jaw the nystagmus was directed to the left

and that with release of this pressure it was directed to the right. I thought that we were dealing in this case with a fracture of the pyramid and assumed that nystagmus could be produced as well in the left auditory canal. As a fact, however, there was a reversed fistula symptom and on pressure a marked nystagmus to the right and on aspiration nystagmus to the left and similar to the results found on pressure below the mastoid process. I, therefore, demonstrated the patient with the diagnosis, fracture of the left pyramid. While demonstrating the patient on a later occasion I was asked by an American doctor as to the status of the other side. Until then I had not examined the other side at all. My surprise and chagrin were great when the examination revealed an analogous, even though somewhat slight, reversed fistula symptom and likewise reversed reaction on pressure under the mastoid process. I abandoned the diagnosis of fracture of the left pyramid and on renewed thorough examination of the patient demonstrated the fact that he had been admitted to the nerve clinic because of lues. Further examination developed the fact that pressure over the carotid artery evoked nystagmus in the same direction as that in the auditory canal, but rather more slight in character and also slighter than that under the mastoid. Release of pressure showed a slight nystagmus to the opposite side. I also gained the impression that the pressure below the mastoid compressed an abnormally large blood vessel. Notwithstanding these findings, the case remained indefinite.

In 1913, I visited the Otological Congress in Brussels, where Hennebert exhibited two cases with his described symptoms, one of which was a case of hereditary lues, with pronounced reversed fistula symptom.¹⁷ This case reminded me of my own. I described my case and asked Hennebert to examine his case in the same manner. As the result of this examination it was found that the pressure between the mastoid and the lower jaw produced an intense nystagmus and the release of pressure a nystagmus to the opposite side, exactly as it had occurred in my patient, and in the opposite direction to that on compression in the auditory canal. Pressure over the carotid artery was negative. On my return to Vienna I searched for similar cases and also examined a group of labyrinth fistulae, but found no case in which these symptoms could be evoked. I saw another case, luetic in character, presented by E. Urbantschitsch in the Austrian Otological Society¹⁸ that showed exactly the same character as my two first cases.

On my return from war imprisonment in 1916, I again found my previously seen case with lues of six months' duration. This case

showed not only the slow, rocking ocular movement, but also showed plainly the reaction following compression of the blood vessels, but in some directions unlike the other cases. The other cases of hereditary lues had all shown a very marked reversed fistula symptom by auditory canal test. The nystagmus and reversed nystagmus similar to that produced in the canal could also be demonstrated with firm pressure and release of pressure under the mastoid. Compression and release of compression over the carotid produced a lighter effect in one case than under the mastoid; in another case it was negative. In this last case at the outset a slow movement to the right was demonstrable. Pressure under the mastoid over a pulsating vessel developed a slow movement opposite to that from the ear (to the left), pressure over the right carotid a slow movement as from the ear (to the right), pressure over the left carotid an opposite movement to that of pressure over the right carotid (to the left), pressure and aspiration in the left ear and pressure over the angle of the left lower jaw produced on November 23 a very weak reaction, and after November 24 a negative result. On November 27 the findings had been changed to such an extent that spontaneous, slow ocular movement synchronous with the pulse had developed (systole to the left). The ocular movement from the right auditory had become slight, the movement on pressure over the right mastoid had disappeared. On the other hand, pressure over the right carotid produced a slow movement to the right and release of pressure a marked nystagmus to the right. Compression of the left carotid produced the opposite effect to that of the right.

November 29 the slow ocular movement was reversed (systole to the right). Pressure on the right carotid produced nystagmus to the left and release of pressure, nystagmus to the right. Pressure on the left carotid now did not influence the spontaneous, slow ocular movement, but on continued pressure nystagmus was developed to the right. Straining of the abdominal muscles produced very marked nystagmus to the right the same as that produced by release of pressure over the right carotid or continued compression of the left carotid; negative abdominal pressure as in deep inspiration with closed nose and closed mouth produced nystagmus to the right, but to slighter degree than by pressure. On compression of both carotids nystagmus was produced to the left.

On December 1, after six days of daily iodine administration the slow ocular movement was still to be found, but slighter than on November 29. From the canal no ocular movement could now be demonstrated. Pressure still showed considerable nystagmus to the

right, compression of the right carotid showed slight nystagmus, compression of the left carotid showed some nystagmus to the right and release of compression some nystagmus to the left. These were my last findings in this patient, of whom I then lost sight.

The findings in this case differ from those in the previous cases, in that the fistula symptoms from the auditory canal and from the mastoid were but slightly exhibited, yet on compression of the carotid produced an unusual, marked reaction. I might observe that in obtaining a negative result on pressure over the lower jaw I did not feel a pulsating vessel, but that when the result was positive the pulsating vessel was in evidence.

In attempting an explanation of this phenomena we must consider the explanation of the Hennebert fistula symptom more minutely. I assumed at the outset that this symptom was dependent on an abnormal mobility of the stapes, and am still of this opinion. Robert Lund, of Copenhagen, has supported this opinion by substantial argument. It points to the fact that a number of cases of lues with this symptom demonstrate a negative Rinne and leads to a consideration of an affection in the region of the stapes. The reddening of the promontory as observed by Alexander¹⁹ in two cases, as Dr. Fremel also observed, on the case I have here reported, substantiates this opinion. I believe that the Hennebert fistula symptom can be explained through abnormal mobility of the stapes. This, however, does not explain the vasomotor phenomena in these cases. Before I attempt this explanation I wish to discuss further clinical findings in actual fistula cases. After I had been in Upsala for a year Dr. Robert Lund, of Copenhagen, visited me (May, 1918) and reported the observations that had just been made by Dr. Mygind of a new fistula symptom; four cases of labyrinth fistula in which he had found nystagmus on compression of the carotid. I was dressing a little patient at the time, who complained of vertigo and had been operated for radical mastoid, but in whom no fistula symptom had been observed before operation. As Lund described the Mygind observation, I said: "I have searched for such labyrinth fistula while in Vienna, but have never seen such a case; perhaps this is such a case." I examined this little patient and was very much surprised when all of these symptoms were plainly demonstrable. They were not as typical as in the luetic cases. I have since found this symptom in a large group of fistula cases, but cannot agree with Mygind in the claim that this vasomotor fistula symptom is constantly present in all labyrinth fistulae. It is frequently absent. Here, too, Mygind is in error if he thinks that the location of the fistula can be better

determined by his test than by means of the usual tests. Aside from these two factors, I can substantiate the findings of Mygind. I might add that in these fistula cases also the pressure under the mastoid (between mastoid and lower jaw) repeatedly produced marked nystagmus. In the individual findings of these cases, however, the first case showed a decidedly different reaction from those of the luetic cases.

E. B., female, 16 years old; radical operation of left ear, May 2, 1918. Patient had spontaneous nystagmus to the right. On pressure over the left carotid spontaneous nystagmus disappeared; on release of pressure nystagmus appeared to the left. Pressure over the right carotid was negative. Pressure under the left mastoid produced a nystagmus to the left; release of pressure, marked nystagmus to the left, more marked than on release of carotid compression.

Compression in the canal produced nystagmus to the left the same as pressure under the mastoid. Aspiration developed very weak nystagmus to the right.

In this case the regular reaction as found in the luetic cases is absent. It is very evident that the adhesions in the labyrinth have developed an unusual course in the movement of the endolymph. Rocking, slow, ocular movement was not found in this patient. Other fistula cases that have a bearing on this subject may be reported as follows:

E. J., female, 27 years old, July 30, 1918. Fistula in left horizontal semicircular canal. Canal compression test, nystagmus to the left; aspiration, nystagmus to the right; continued compression of left carotid produced slight nystagmus to the right, release of compression; slight nystagmus to the left (reversed as in the canal). Test on mastoid pressure the same as in carotid compression and release.

J. A., female, 46 years old, January 20, 1920. Fistula in left horizontal semicircular canal. Spontaneous nystagmus to the left with eyes turned to the left, on gazing directly forward, ocular movement synchronous with the pulse, systole to the left, diastole to the right. Pressure on the right carotid, nystagmus to the right and on release, very marked nystagmus to the left; the same reaction observed on pressure over the left carotid, but not quite so marked. During vomiting the spontaneous nystagmus to the left ceased. When vomiting ceased there was marked nystagmus to the left. January 21, ocular movement synchronous with the pulse as of yesterday. Occasional spontaneous nystagmus weak on lateral glance.

Right and left carotid compression showed weak nystagmus to the right and release showed marked nystagmus to the left. On pressure weak nystagmus to the right, on release stronger nystagmus to the left. January 22, same status. Gradual disappearance of these symptoms.

W. L., male, 26 years old. Fistula of right semicircular canal. May 19, 1919, slow ocular movement synchronous with the pulse. Systole, nystagmus to the right, diastole, nystagmus to the left. On pressure, slow nystagmus to the right, ear compression, nystagmus to the right, aspiration, nystagmus to the left.

May 20, operation under local anesthesia.²⁰ After the operation strong ocular movement synchronous with the pulse as before. Pressure over the right carotid, nystagmus to the left. Pressure under the right mastoid, nystagmus to the right.

G. H., female, 22 years old, October 14, 1920. Fistula in the region of the ampulla of the left horizontal semicircular canal. This case is of especial interest because the fistula symptom developed following the extraction of a polypus. I thought I had injured the stapes. At the operation, however, we found a fistula in the ampulla of the horizontal semicircular canal. Apparently the polyp developed from this point and perhaps at the time of its extraction a small sequestrum was removed with the polypus. Immediately after the polyp extraction, compression in the right ear produced slow nystagmus to the left, aspiration, weak, a slow nystagmus to the right. Slight ocular movements synchronous with the pulse were also observed. No nystagmus was produced on pressure of the carotid. Some spontaneous nystagmus to the left was produced by glance to the left. October 16 and 17, no ocular movement synchronous with the pulse could be observed. Compression in the canal produced a slow ocular movement to the right. Aspiration, movement to the left (reversed as before). October 18, left carotid compression nystagmus to the right, on release nystagmus, left. October 19, marked ocular movement synchronous with the pulse; systole to the right, diastole to the left. Compression of the left carotid showed nystagmus to the right, release, nystagmus to the left (more marked than to the right). No nystagmus on compression of the right side. October 20, operation under local anesthesia. Fistula found in the ampulla region of the horizontal semicircular canal; on touching this point immediately nystagmus to the left. The fistula was so small that it could not have been determined without local anesthesia. January 21, no nystagmus.

L. A., female, 36 years old, November 4, 1919, caloric reaction left, normal in upright position of the head; compression in the right canal, nystagmus to the left; aspiration, nystagmus to the right. Pressure over the right carotid, nystagmus to the left, release, nystagmus to the right; left carotid, negative. November 5, rocking ocular movement synchronous with the pulse. Systole to the right; pressure on the right carotid, nystagmus to the left; release, nystagmus to the right. Pressure between the right lower jaw and mastoid the same; left carotid, the same. Operation under local anesthesia. The fistula in right horizontal semicircular canal the size of a pin-head. November 8, on right carotid compression, nystagmus still present, but slight. November 11, compression of the right carotid, nystagmus to the left, but slight. December 4, fistula symptoms still present, carotid compression more apparent but weaker nystagmus. No nystagmus on pressure over the mastoid. December 8, fistula symptom has disappeared. Pressure over the carotid without effect.

From this group of cases we may conclude that the vasomotor phenomena in labyrinth fistula may be very much diversified. All possible combinations may occur. Pressure in the ear may produce the same result as pressure over the mastoid. Pressure over the carotid may produce the converse result of pressure in the ear. Pressure over both carotids may produce the same effect.

These unusual irregularities in fistula cases demonstrate that these phenomena are not due to a central reaction of vasomotor influence in the medulla oblongata, for central changes of such a character that they can produce these marked differences and irregularities in uncomplicated cases of labyrinth fistula are incomprehensible. It would not be difficult to assume that the circulation of the endolymph in these several cases meets with various obstructions, or that the pathologically dilated vessels may even occur in some other localities. Irregularities in the circulation of the endolymph must be recognized where the fistula symptom itself seems irregular and especially where no caloric reaction is present.

At the time of the occurrence of the vasomotor fistula symptom only one case (L. A., 36 years old) was examined that showed reaction. In the other cases the caloric test was omitted. The theoretic significance of this test was not considered at the time. The conditions for the vasomotor phenomena are about the same as those for the slow ocular movement. They often occur conjointly. Vasomotor irritability may occur even in cases where spontaneous, slow ocular movement is not in evidence and the reverse condition has

also been observed in one case. The conditions of these two phenomena, therefore, are quite similar, but not identical.

Mygind claims that these symptoms can no longer be observed after the radical operation. This does not apply to my cases. I have frequently observed these symptoms after operation. Where general anesthesia is used for the operation, a labyrinthitis with injury to the nerve-end spots occurs quite frequently and with this disappears one of the conditions for the development of this phenomena. Mygind does not mention this factor, but has evidently operated with general anesthesia. Naturally in all cases after operation these phenomena gradually disappear, but a sudden disappearance is not to be expected.

We may expect positive results in the light of this explanation of these phenomena only in the regular cases and in the luetic ones.

Pressure in the auditory canal produces a reversed fistula symptom. This points to a promontory fistula or stapes fistula, for, if the middle ear is intact and the tube patulous, pressure on the membrana tympani can be transmitted only to the stapes. I wish to direct attention to the symptom of psuedo-fistula as pointed out by Karlefors and Nylen, in which always a typical and not a reverse fistula symptom occurs and which probably results from compression of the membrane of the round window. The compression of the stapes directs the endolymph toward the round window and also produces a compression of dilated and, therefore, quite plastic vessels in the labyrinth. In cases of lues, blood vessels may be found in a syphilitic granulation tissue directly about the region of the stapes or the ampulla. The impact of the endolymph is directed from the utricle to the ampulla of the horizontal semicircular canal and produces herewith the reverse fistula symptom (nystagmus to the other side). Pressure under the angle of the lower jaw over an enlarged pulsating vessel produces an opposite nystagmus to that evoked in the ear. The explanation for this seems to be that the hyperemia is hereby increased and the footplate of the stapes is pressed outwards. How may compression of a blood vessel increase hyperemia? This takes place because the checking of the blood in one vessel increases the volume contained in the other branches that are given off from the same vessel. If, for example, the external carotid is compressed and other conditions remain the same, the internal carotid must receive the entire blood volume that before compression was distributed to both the internal carotid and external carotid. In this manner I think the increased blood volume to a vessel may be explained. If this hypothesis is correct, this aspiration of the

middle ear must have the same effect on one side as compression of the common carotid on the opposite side, and finally the same movement should occur with systole as with compression under the mastoid. This, however, checks up in the luetic case only in the first day of our observation, for later the slow movement in conjunction with the pulse is reversed. With these exceptions the other conclusions of this observation tally. Here is another point for consideration: the internal auditory artery which supplies the labyrinth is given off from the vertebral artery. This is in direct communication with the carotid through the circle of Willis. Pressure on the neck may also involve the vertebral artery. In this manner rather complicated relations are developed which may be hard to analyze, namely, whether compression of one or the other blood vessels may produce hyperemia of the internal auditory artery or of its dilated branch. It is therefore of especial interest to note that in lues this same phenomenon should be observed. This complex arterial distribution may also explain the fact that such irregular findings are present in fistula.

In the previous problems we have always discussed compression of the carotid. There has not been sufficient research to determine to what extent compression of the jugular vein may participate in this observation. Only in one case (L. E., female, 11 years of age, November 4, 1919) have we attempted to compress the jugular vein without compressing the carotid. Here apparently pressure on the jugular produced the same effect as pressure on the left carotid, namely, nystagmus to the right and with release of pressure, nystagmus to the left; pressure on the right jugular vein and right carotid had no effect. The fistula was on the left side, probably in the oval window. It is interesting to note in this case that on December 4, pressure on the abdominal muscles produced nystagmus to the right and release of pressure, nystagmus to the left. The next day, however, a reverse effect was observed. On pressure there was nystagmus to the left and on release of pressure nystagmus to the right. On December 15, the symptoms were again reversed and on abdominal pressure there was marked nystagmus to the right and release of pressure, nystagmus to the left; pressure on both jugular veins had the same effect as on December 4, namely, nystagmus to the right and release of pressure produced nystagmus to the left. Pressure on both carotids produced similar nystagmus, though more marked than by compression of the jugular alone.

To complete the notes on this case the following may be marked: compression in the auditory canal evoked the regular fistula symp-

tom, nystagmus to the left, aspiration, nystagmus to the right; a large vibrating tuning fork applied to the vertex produced nystagmus to the right (December 5), movement of the head backwards produced nystagmus to the left (December 6). The galvanic fistula symptom (Brüning) showed nystagmus to the right with kathode to the right, 2 m.a.; anode to the right, 4 m.a.; kathode to the left, 2 m.a.; anode to the left, 2 m.a. Amylnitrit inhalations with which Borries²¹ produced nystagmus in similar cases were negative (December 7, December 18). Hyperemia of the neck (Borries *ibid.*) produced no distinct effect (December 14). On December 15, rapid turning of the head to the right produced nystagmus to the left and turning to the left produced nystagmus to the right, a rare occurrence, as this movement usually precedes the reversed nystagmus reaction. On this day attacks of spontaneous nystagmus to the right were also observed. On December 17, pressure produced slight result, pressure on both jugular veins was also negative. The fistula healed later and the phenomena disappeared.

I have under observation (June 16, 1921) a case of fistula of the left horizontal semicircular canal, with typical fistula symptom, in which compression of both jugular veins and pressure produces nystagmus to the right. On release of jugular compression and of pressure, nystagmus to the left is produced. This phenomenon was still present two days later after radical operation under local anesthesia, but weaker than preceding operation. Evidences of labyrinthitis did not occur after the operation.

In conjunction with this case we might attempt to separate the effect of compression of the jugular vein from that of the carotid. We may readily assume that compression of the jugular would produce a blood stasis. The result then should be just the reverse of that produced on compression in the auditory canal. That is true in this case. It is more difficult to explain why compression of the carotid should produce the same effect, but here, too, we may assume that compression of the carotid increases the supply to the vertebral artery and the jugular compression might be simultaneously affected. Of course, it is impossible to explain every detail here. I think we should be satisfied to understand certain facts. The change in the effect of abdominal pressure proves how impossible it is to offer precise explanations in these cases.

There are still two observations to which I wish to call attention. It is a rather rare occurrence that patients get an attack of nystagmus on air inflation into the middle ear. Dr. Martin Hening recently observed such a case and has, in my opinion, made a valuable

suggestion concerning the origin of this mechanism. During air inflation of the middle ear cavity, the membrana tympani is bulged outwards, but with the condensation of air in the tympanic cavity a compression of the round window takes place. These counter-acting influences in the movements of the fenestrae, which become especially prominent in cases of mucous catarrh where air is forced into the cavum tympanum suddenly after overcoming some obstruction and where its egress is difficult, could readily account in such cases with more decided reaction for a marked nystagmus. Typical fistula symptoms must, of course, be present on the side of the air inflation.

Another phenomenon is embodied in the observations of my assistants, Karlesfors and Nylen, of pseudo-fistula symptoms. Their reports have been made to the Northern Oto-Laryngological Congress in Christiania, July, 1920, and to the *Versammlung Deutscher Naturforscher* in Nauheim, September, 1920. These observations will be published shortly in the "*Acta Oto-Laryngologica*." I desire here to state briefly: in cases of perforation of the drum membrane, either of acute or chronic suppuration, dry perforations or residual after-suppurations, it has been found that fifty per cent of such cases react to the typical fistula symptom on vigorous pressure (sixty to one hundred mm. mercury). The unusual characteristic of this observation is that the nystagmus occurs only after a latent period following the pressure act, that it is first directed to the tested side; that its recurrence is not frequent, and that usually after the second or third test it disappears. Aspiration has the opposite effect. Reverse nystagmus occurs quite frequently when the pressure is continuous and when the nystagmus to the tested side is allowed to fade away. This phenomenon I regard as of central character, likewise the inexcitability of nystagmus on repetition of this test. The first phenomenon is similar to the nystagmus of rotation and to the inverse nystagmus on rotation (Buys)²² as also of the rarer phenomenon observed by Buys²² that in bending the head to the shoulder nystagmus first occurs to the tested side and after a short time nystagmus occurs on the other side. This phenomenon is similar to that observed by me in pathological cases and analyzed in detail by Nylen²⁴ and also occurring in the normal relations, namely, that if the subject is directed to gaze for a continued period to the right and then shifts the gaze directly forward, a few impulses of nystagmus to the left will occur. It is also analogous to the Charpentier illusion of the movements of a lumincus point in the dark. If one gazes for a

time on such a luminous point, an apparent movement in one direction is observed and after a time this movement is spontaneously reversed. Apparently unconscious, slow, ocular and head movements are here in question. The central relations concerning this reverse of nystagmus must also play a role in the vasomotor relations and explain one or the other phenomenon without our being able to precisely analyze them. Regarding the pseudo-fistula symptom, we must assume that the membrane of the round window is pressed inward. The latent period in this nystagmus depends on the absence of an elastic spot in the labyrinth capsule (the stapes is pressed in the same direction) instead of which partly blood and partly endolymph is pressed out of the labyrinth and this causes an interval in this reaction.

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OTO-SCLEROSIS (IDIOPATHIC DEGENERATIVE DEAFNESS).

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To the otologist who wishes something to cure, oto-sclerosis offers little, to him who wishes something to investigate it embodies the most interesting theme in otology and one second to none in the whole realm of medical science. In this paper it is proposed to review very briefly the more important aspects of the work which has been done on the subject during the last fifteen or twenty years or so.

Age Incidence.—As regards age incidence, there is general agreement that otosclerosis arises most frequently between the ages of twenty and forty, but cases under twenty and even under ten are more frequently recorded than formerly.

Sex.—It is also agreed that the disease is more frequent in women than in men in the proportion of about three to two, although Gray¹ puts it a little higher. The latter writer also points out that the number becomes much more equal in the two sexes after the age of forty.

Heredity.—The subject of heredity in otosclerosis, as in other branches of medical science, is difficult. Körner² and Hammerschlag³ attach very great importance to hereditary influence, and Gray⁴ considers that this factor is much more frequently present than is usually suspected. On the other hand, Randall⁵ estimates hereditary influence much lower as a factor than most observers. The percentage of cases which may be considered as inherited varies greatly, according to different authorities. Thus Siebenmann puts it at 35 per cent, while Bezold estimated it at 82 per cent. It is very doubtful if the percentage can be given in actual figures of any value, since different observers do not agree as to what does and what does not constitute evidence of hereditary influence.

As regards hereditary influence as shown in actual family trees, Gray,⁶ showing its occurrence in varying degrees, Hammerschlag⁷ gives an extremely interesting family tree which illustrates the case in which an uncle, who was a victim of oto-sclerosis married his niece, who was also a victim of the same disease. Seven children were born of this marriage and every one became the subject of oto-sclerosis.

A curious case is described by Paul Bonsour. A woman in whose family history no evidence of oto-sclerosis was found, and who did not suffer from the disease herself, was twice married. Neither her first husband nor her second husband suffered from deafness, but the family histories of neither husband are given. By her first husband she had one son, who became the victim of oto-sclerosis at the age of fourteen. By her second husband she had also one son, who became oto-sclerotic at the age of twelve.

In regard to the subject of hereditary influence in oto-sclerosis, there is no evidence that the Mendelian principles can be applied to this condition. Further investigation may bring about a change of view in respect to this aspect of the question, but at present the difficulties of obtaining facts in support of the application of Mendel's laws to the particular case of this disease, have not yet been overcome.

Etiology.—The question of the etiology of this disease is a very difficult one. There are few affections, local or constitutional, that have not been cited as the fundamental causative agent of oto-sclerosis. Some of the suggestions are almost bewildering. Thus, while the ovary is regarded by some writers as the evil genius of the play, others consider the testicles the offender. Now it is difficult to see how either of these structures can be looked upon as the cause of the disease, since it is very common in both men and women. Perhaps, however, there is some internal secretion which is identical in both organs, the excess or deficiency of which may be the cause of the disease. The thyroid gland, the pituitary gland, the suprarenal capsule have all been looked upon as the causative factor. Now, it must be noted that a large percentage of oto-sclerotics remain in habitual good health, which is hardly compatible with excess or deficiency of the internal secretion of any of these glands. Furthermore, when these glands are obviously diseased, as in myxedema, exophthalmic goiter, Addison's disease, acromegaly, etc., there is not found to be any particular tendency to oto-sclerosis.

Absorption of toxins from various sources have been looked upon by many as the cause of oto-sclerosis. Thus intestinal stasis with consequent absorption of poison through the bowel, appendicitis, diseased tonsils, abscess of the maxillary antrum and sphenoidal and ethmoidal sinuses have all been considered causative factors. And within narrow limits no doubt some claim may be made for these views.

Infection from the middle ear is considered by Fraser⁸ to be the chief factor. This is somewhat similar to the view of Haberman and there is no doubt that oto-sclerosis does sometimes occur in the course of chronic middle ear disease.

Attempts have been made to associate oto-sclerosis with various diseases of bone as having a common etiological factor, such diseases, for example, as osteo-malacia, rickets, osteo-arthritis. But so far as the present writer is aware there is no evidence that oto-sclerosis occurs with any particular frequency in these diseases.

Factors such as pregnancy, anemia, nervous exhaustion, are well-known and recognized; but, after all is said concerning these, it must be admitted that oto-sclerosis occurs more frequently when they are, individually, absent than when they are present.

Perhaps the present reviewer may be excused for suggesting that when we start to investigate the etiology of oto-sclerosis, we do not set the problem before us in the proper light. Instead of considering the problem in the light of an individual case or of a small group of individual cases, it might be better to view it from a distant point of view. Thus, oto-sclerosis consists of a change in the bony capsule of the labyrinth, bilaterally symmetrical, making its appearance very gradually and occurring in individuals who may be in ill-health from various widely different causes, but very frequently are in the best of health. Other changes in the nerve elements in the ear are frequently present and perhaps always. The other general aspect of the problem is that the majority of individuals never do suffer from oto-sclerosis, no matter how badly or from whatever cause their general health becomes affected, or whether they suffer from some other local disease of the ear, such as suppuration, middle ear catarrh, etc., or not. Now it appears to the writer that, viewed from this point of view, the logical conclusion to be drawn is that the cause of oto-sclerosis, that is the condition without which the disease cannot occur, is to be found in the organ of hearing itself, and, further, that this condition exists in the organ of hearing of certain individuals and in these individuals only. From this point of view, which the present writer believes to be the correct one, oto-sclerosis is idiopathic. That is to say, the disease occurs in people who have an inborn tendency to it, and that this is the only constant factor in the etiology. No doubt disturbances, either locally in the ears or constitutionally in the bodies of these individuals, may precipitate the onset of the disease, but no particular one of these disturbances need be present and in many cases they may all be absent.

The single constant factor in the innate tendency to the disease and the fact that hereditary influence is evident in many cases is strongly in support of this view.

Pathology.—Our knowledge of the pathological anatomy of otosclerosis has made great advances during the last twenty years, but even in this respect otosclerosis still offers many baffling problems. Regarded from the point of view of the pathologist the outstanding feature of the disease is the change which occurs in the bony capsule of the labyrinth. The exact site at which the change takes place is, in the great majority of cases, immediately in front of the oval window, but not uncommonly focuses are also found in other parts of the cochlear portion of the capsule. Very rarely, if ever, is any change found in the bony capsule of the semicircular canals. The condition is bilaterally symmetrical to a striking degree, though Manassi has described a case in which only one ear was affected by the characteristic change in the bone, the opposite ear being the seat of changes in the nerve structure of the cochlea.

Until recently it was supposed that the change lay in absorption of the normal bone, associated with the deposition of new bone, the latter being in excess of that which was absorbed. Furthermore, the new bone is found to be more porous in character than the old, and contains medullary spaces. In 1917, however, the present writer⁹ described two other types of change in the bony capsule. In one of these latter types there is absorption of bone without any deposition of new bone at all. In the third type there is both absorption and deposition of bone, but the absorption takes place more rapidly than the deposition and hence a process of continuous rarefaction takes place until the diseased area shows only a few fine trabeculae of bone, the large enclosed spaces being filled with marrow.

As regards the first, and by far the commonest type of bony change, a great deal of controversy has taken place as to the process by which it occurs. Siebenmann, Brühl, the present writer, and others, maintain that the process is not of the nature of a chronic inflammation, while Panse, Manasse, Fraser,¹⁰ Muir, Bryant and others look upon the process as being inflammatory in character, and consider it to be a form of osteitis. Now, every pathologist admits that chronic inflammation is a condition which it is not easy to define, and the present writer does not desire to express himself very strongly on this matter. It should, however, be noted that a sharp line of demarcation is not what one usually associates with chronic inflammatory activity, but rather with the outline of some

innocent tumorous or with an infarct. Round cell infiltration also is usually associated with chronic inflammation, and the present writer has failed to find such a condition in his own specimens.

The actual process by which the absorption of the normal bone occurs is also under dispute. Manassi¹¹ holds the view that the first change in the bone is not absorption, but deposition of new bone. This deposition of new bone, according to him, causes absorption of the old bone by means of simple pressure. Furthermore, Manassi maintains that the old bone is not absorbed by osteoclasts. Brühl, Siebenmann, the present writer, and others hold the view that the old normal bone is absorbed first, and that the new porous bone is subsequently deposited in its place.

The present writer ventures to think that the old bone is absorbed by osteoclasts just as the process occurs in the ordinary natural phenomena of bone physiology. It is true, as pointed out by Manassi, that frequently one does not find osteoclasts along the line of demarcation. But this is probably merely due to the fact that in the great majority of cases the disease had begun many years before the examination of the temporal bone was made and consequently activity had ceased so far as further changes in the bone were concerned. That this is actually the case is shown by the fact that as time progresses the affinity of the diseased porous bone for stains diminishes until it becomes no greater than that possessed by the old normal bone of the labyrinthine capsule. It must not, therefore, be expected that osteoclasts will be in any noticeable evidence at the line of demarcation in these cases, because absorption is no longer going on. When, however, an early case of oto-sclerosis is examined, it is found, as shown by the present writer,¹² that osteoclasts are abundantly present along the line of demarcation.

Mager is of the opinion that the absorption of the bone is brought about by the proliferation of the connective tissue cells of the marrow.

Leaving the subject of the bony change as found in the great majority of cases of oto-sclerosis, a few words may be said in respect to the two other types described by the present writer.

In one of the cases the patient was in a fairly advanced stage of phthisis pulmonalis. When the temporal bones were examined after death it was found that a change in the bone had occurred in the usual place immediately in front of the oval window. The lesion was, as is usual in oto-sclerosis, bilaterally symmetrical and there was the usual sharp line of demarcation. In the diseased area the

bone had been absorbed to a very large extent, but as new bone had been deposited, a considerable part of the diseased area consisted of little more than a network of blood vessels. It is difficult to explain the occurrence of this type of bony change, unless it be that the phthisis from which the patient suffered, interfered in some way with the deposition of bone in place of that which was absorbed.

The third type, also described by the present writer, was found under peculiar conditions. The patient died at the age of eighty-five. She had been the victim of oto-sclerosis for sixty years. On examination of the temporal bone the usual bony change of oto-sclerosis was found to be present in the usual place in front of the oval window. This had led to fixation of the stapes, and, indeed, the whole of the footplate of the stapes had undergone a similar bony change. There was found, however, another change in the bone in the region behind the oval window. This consisted of an extensive absorption of bone, associated with a very small deposit of new-formed, deeply stained bone. As a consequence of this process, the bone in this area had undergone rarefaction to a remarkable degree. The process here was evidently active at the time of death, as osteoclasts were found in the process of absorbing the old bone, and in some parts even absorbing the newly-deposited, deeply stained bone.

While great advances have been made in regard to the pathological aspect of oto-sclerosis, no great corresponding advances have been made in our knowledge of the disease as viewed from the clinical standpoint.

The causative factor of tinnitus is still in doubt, though several theories have been put forward to explain its occurrence. Neumann considers it to be due to degenerative changes in the nerve-structures and some look upon it as due to changes in the labyrinthine fluids, either chemical or physical. It may perhaps be due to pathological changes in the cortex cerebri.

The explanation of the occurrence of paracusis is still to seek. As is the case in regard to tinnitus, so also with paracusis; there has been much speculation, but little observation of new facts. No doubt this is in large part due to the inherent difficulties of investigation. The present writer ventures to suggest that these difficulties will remain until we are in possession of a much greater knowledge of nerve-physiology than we have at present.

In the matter of diagnosis, Fröschels has introduced a new test. It is based upon the diminished sensitiveness of the meatus and

tympanic membrane which occurs in oto-sclerosis. By means of a small feather attached to a probe, the membrane is greatly stimulated. If the patient does not feel a tickling sensation so much as does a normal individual the probability is that oto-sclerosis is present. The difficulty of the test lies in finding a normal standard; but with experience the investigator can often arrive at a helpful conclusion, for there is no doubt of the fact that in oto-sclerosis the sensitiveness of the structures mentioned is greatly diminished.

There has been but little advance in the treatment of the disease. Otologists are coming more and more to regard attention to the general health as the chief element in treatment. Avoidance of exhaustion, either of the mind or body, plenty of sleep, and the treatment of any constitutional affection (especially anemia in young women) are still the recommendation of those most experienced in the knowledge of oto-sclerosis.

A new method of treatment has recently been recommended by Allfell. It consists of syringing the ear with hot and cold water alternately. The temperature of the cold water should be 20° C. and that of the hot water 50° C. The present writer has tried this method and found it valueless in oto-sclerosis. Incidentally, he has found it useful in some cases of Menière's syndrome, but oto-sclerosis was absent in those cases.

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COMPLICATIONS AND SEQUELAE OF MASTOIDITIS.

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It is certainly a great honor to be asked to write an article for the Twenty-fifth Anniversary Number of *THE LARYNGOSCOPE*. Unfortunately the subject assigned to me is so large that its proper consideration would fill many numbers of this Journal. I hope my readers will realize, therefore, that in dealing with this large subject I shall be obliged to give each complication much less attention than it really deserves. It will be impossible to go deeply into the symptomatology, diagnosis and treatment of these various conditions, as many pages could well be written upon each. I shall give but passing mention to such complications as: Failure to cause cessation of discharge from the middle ear, failure of the mastoid wound to close promptly with the persistence of a sinus behind the ear, and early recurrence of mastoiditis and the development of deep abscesses in the tissues of the neck.

With rare exception all of these complications mean either an incomplete primary operation or some fault in the aseptic technique. It is only rarely that the poor reparative powers of the patient are responsible for these complications. If the entire pneumatic structure of the mastoid is obliterated at the time of operation, then the discharge from the ear usually ceases in a week or ten days and prompt closure of the mastoid wound takes place without any of these complications. Persistent discharge from the ear ordinarily means that some diseased pneumatic cells have been overlooked and the same applies to failure of the mastoid wound to close. The cells most commonly overlooked by the operator are those which lie just above the knee of the lateral sinus between this structure and the roof of the tympanum and mastoid. This region should be exenterated in every case, even although firm bone seems to have been reached before these cells are encountered. The cells located at the root of the zygoma are also occasionally left and these are a not infrequent cause of persistence of aural discharge and delayed healing of the mastoid wound. The root of the zygoma should be investigated in every case and the cellular structure ablated. Deep cells in the lower portion of the mastoid either in front or behind the lateral sinus are sometimes overlooked and the failure to exenterate these cells may not only cause the first three complications above alluded to, but may also cause infection of the deep cervical tissues

and render a counter-opening necessary. In other words, a rapid recovery from a mastoid operation means careful technique on the part of the operator, the removal of all diseased bone and strict adherence to aseptic principals during subsequent dressing. If all of these points are carried out the mastoid wound closes promptly, the discharge from the ear ceases and a recurrence of the mastoiditis is comparatively rare.

The above are but minor complications of mastoiditis. The serious complications are those which involve either the labyrinth or the intracranial structures. Involvement of the labyrinth following an acute infection of the mastoid is exceedingly rare and I recall but one instance of this in my practice. In this particular case the middle ear suppuration had lasted for many weeks before the mastoid operation and the case might almost have been classed as one of chronic suppuration. In this particular instance the labyrinthine symptoms appeared suddenly several weeks after the mastoid operation. Invasion of the labyrinth occurred through the horizontal semi-circular canal. The patient made a complete recovery after thorough drainage of the labyrinth.

A middle ear condition simulating labyrinthine involvement is a peri-labyrinthitis. In these cases the labyrinth itself is apparently uninvolved, but certain labyrinthine symptoms make their appearance, due to the invasion of the cells immediately surrounding the bony labyrinth. Whether the changes which occur in the labyrinth are merely circulatory or whether certain chemical changes take place in the labyrinthine fluid is purely a matter of conjecture. The differential diagnosis between a peri-labyrinthitis and a true invasion of the labyrinth is sometimes difficult. If a labyrinth is invaded the nystagmus is always directed towards the healthy side shortly after the labyrinthine symptoms appear, that is within 36 to 48 hours. In the early stages of labyrinthine invasion this nystagmus may be directed both to the diseased and healthy side. In a true labyrinthitis it soon becomes directed only to the healthy side. In a peri-labyrinthitis nystagmus in both directions persists. The caloric reaction of the labyrinth is always lost in a labyrinthitis, but is not lost in a peri-labyrinthitis. Recovery from all labyrinthine symptoms occurs promptly after a mastoid operation in cases of peri-labyrinthitis, while with involvement of the labyrinth these symptoms only disappear after the labyrinth has become dead or has been removed by operation.

The differential diagnosis between a serous and a purulent labyrinthitis is, I believe, practically impossible in the early stages. In a serous labyrinthitis the temperature is apt to be lower and a spinal

puncture reveals little or no increase in the number of cells present in the spinal fluid. In a purulent labyrinthitis the temperature is apt to be somewhat elevated and the spinal fluid cell count high. The serous form of inflammation, however, is the first stage of the purulent form and it is impossible in the early stages in any given case to say whether the process will continue to be a serous one or whether it will progress to the purulent form with subsequent invasion of the meninges. My own case books show fourteen cases of labyrinthine invasion which have been operated on and of these four were cured and ten died. Of course, most of these cases were cases of chronic middle suppuration and I give the statistics simply to show the mortality in cases of labyrinthine disease subjected to operation.

Passing now to the intracranial complications of mastoid involvement we have to consider, first, an extra-dural abscess; second, sinus thrombosis; third, brain abscess; and fourth, meningitis.

Taking these complications in the order given we have first to speak of extradural abscess, the most frequent intracranial complication of mastoid inflammation and one which can be dismissed in a very few words. An extradural abscess is most frequently situated about the lateral sinus; the next most frequent location is the middle cranial fossa. An extradural abscess gives rise to very few symptoms and is frequently unrecognized until the time of the mastoid operation. Its presence may be suspected when the patient complains of localized headache, sleeplessness and has a temperature elevation rather greater than would be accounted for by the mastoiditis. Many cases of mastoiditis in adults run an afebrile course. Given a case of mastoiditis with temperature of 101° or $101\frac{1}{2}^{\circ}$ and localized headache, an extradural abscess might well be suspected. This suspicion would be strengthened if percussion of the skull showed an area of extreme local tenderness. A differential blood count would probably show a higher percentage of polymorphonuclear cells than would be present in a mastoiditis. If a spinal puncture were made globulin would probably be present in the spinal fluid, and there might be a slight increase in the number of cells. Changes in the ocular fundus would also point to an extradural abscess provided the other symptoms did not point to one of the more severe intracranial lesions. These cases almost invariably recover after operation and I feel that the presence of an extradural abscess at the time of operation in no way increases the gravity of the prognosis. It is simply necessary to exenterate the abscess, by removing all bone about the diseased dural area until healthy dura is

reached. The after-treatment is identical with the treatment of a simple mastoid wound.

Sinus Thrombosis: A septic thrombus in the lateral sinus may occur not only as a complication of mastoiditis, but may also occur primarily from an acute middle ear inflammation. In these latter cases the route of infection is through some dehiscence in the floor of the tympanic cavity directly to the jugular bulb. More frequently infection of the sinus takes place through some area in the sinus as it passes through the mastoid process. If the complication follows mastoiditis the two favorite sites of infection are just below the knee of the sinus, which, I think, is the most common site, and a point just above the jugular bulb. The symptoms of this condition are apt to be misleading and the most misleading symptom is the general good condition of the patient. These patients frequently do not look ill and do not feel very ill. The one symptom which is almost pathognomonic of this condition is the repeated sudden and abrupt rises in temperature occurring once or twice in 24 hours, followed by an equally sudden and abrupt fall. These temperature excursions are rapid and extensive, the temperature frequently rising from 99° or 100° to 104° or 105° in the adult and not infrequently to 106° in children. While chills and chilly sensations may occur preceding the temperature elevation they are by no means the rule and are certainly not present in more than 50 per cent of these cases. I should say in considerably less than 50 per cent. The pulse is accelerated during the febrile period, but when the temperature drops to normal the pulse is but little increased in rapidity. In other words, the pulse-temperature ratio are maintained. When the temperature begins to fall there is usually profuse perspiration and during this period there may be considerable depression. At other times, however, the patient feels, as a rule, well. The tongue is ordinarily coated, and I do not remember ever seeing a case in which the tongue has remained clear. There may be headache, particularly during the febrile period, but this is by no means a constant symptom and may be entirely absent. As the disease progresses the walls of the internal jugular become infiltrated and at this time enlargement of the cervical glands begins. The glands first to be enlarged are those just at the angle of the jaw just above the point where the facial vein enters the internal jugular. The glands below this point gradually become enlarged, but these particular glands at the angle of the jaw are the first to be involved and tenderness and the slight glandular enlargement in this region is always to be looked upon with suspicion. The cord-like band in the neck sometimes mentioned as significant of extension of the thrombus into the

internal jugular vein, I have never seen, even in cases where operation demonstrated that the vein was completely thrombosed throughout the greater portion of the length. A differential blood count ordinarily shows a leukocytosis of less than 20,000, say from 12,000 to 17,000, with a polymorphonuclear count of about 70 to 75 per cent. High polymorphonuclear counts and high leukocyte counts are the exception in these cases. A blood culture may be either positive or negative. If positive, it makes the diagnosis certain at once. If negative, the diagnosis is still doubtful in the presence of the characteristic temperature. It is easy to understand that while a clot remains parietal, infectious organisms are continually being thrown into the blood stream, and a blood culture may be positive provided many organisms enter the blood stream. The bacteriological power of the blood must be borne in mind and if but few organisms enter the blood stream, they may be completely destroyed in the blood or their growth so inhibited that a culture taken from a vein in the arm will be negative. Again when the clot reaches such dimensions as to completely occlude the sinus, the culture may be negative because the infectious area is thus shut off from the general circulation. In these cases the blood culture will only again become positive after the clot has broken down so that the bacteria can again enter the blood stream.

Changes in the ocular fundus occur in this condition as in all cases of increased intracranial pressure. These changes may vary from a simple enlargement of the veins to a true choked disc. The condition may exist on one or both sides. It is perhaps slightly more common in the eye of the affected side, but may occur in the opposite eye, while the eye on the same side remains unaffected.

It is clear, therefore, that the diagnosis of this condition can only be made by a combination of various signs and symptoms. In a case of mastoiditis with numerous excursions in temperature extending over a number of days it is perfectly justifiable to make a diagnosis of sinus thrombosis, even though the blood culture is negative and in doubtful cases it is certainly wiser to explore the sinus and even ligate the vein than to wait indefinitely for a positive blood culture.

Regarding the treatment of the condition this is naturally operative as soon as the diagnosis is made. Considerable discussion has taken place as to whether the vein should be ligated or excised. Both operations have their place. Excision is always a safe operation and theoretically should be applied to every case. The performance, however, consumes more time than simple ligation. In some cases I think the decision as to which operation is to be performed depends largely upon how quickly the surgeon decides that

interference is necessary. We have reports of cases in literature where the surgeon has ligated the internal jugular with a single rise of temperature to 105° and in many cases with a rise not nearly as high as this; in some cases, I believe only to 102° . Here in the early stage excision of the vein would be out of the question and it occurs to the writer in reading of these cases that possibly the diagnosis of sinus thrombosis was a little premature and that many of these cases might have recovered without any interference with the vein at all.

The chief reason for recommending excision of the vein rather than ligation is that the microscopic examination of the veins removed invariably shows an infiltration of the wall of the vessel beyond the limit of the clot. In other words, the condition one has to deal with is one of phlebitis rather than of a simple clot in the vessel. In other words, the inflammatory process within the vessel extends beyond the limit of the clot and if the vessel is not removed below the point of the disease there is danger of the pathological process continuing even after the operation. In the cases operated upon very early it is more than probable that this inflammatory process did not extend below the point of ligation. Hence the success of this operation. If ligation is decided upon, the ligature must always be placed about the internal jugular above the facial vein, otherwise the circulation through the facial would cause infection of the blood stream. It is also important in the operation of ligation to place a ligature about the large anastomatic vessel between the internal and external jugular. This vessel is fairly constant. While ligation is theoretically a simple operation, in many cases it is most difficult, on account of the enlarged glands which overlie the vein just at the level of the facial branch. I think the best anatomical guide for performing the simple ligation is the spinal accessory nerve. If the vein is ligated just below the spinal accessory and if this structure is exposed at the time of operation we are certain that the ligature has been placed above the facial vein. For a fact, I have employed this procedure in but one instance and that in the case of a diabetic on whom it was essential that the operation be performed as quickly as possible. This patient died from his diabetes within twelve hours after the operation. Naturally this is no criticism upon the operation of simple ligation. Aside from this, I have always excised the vein rather than ligating it. It is not necessary to go into the details of the operation. The easiest point to secure the jugular is just below the omo-hyoid muscle, the vein being divided here between two ligatures and then rapidly removed to a point just below the base of the skull or just above the spinal acces-

sory nerve, all tributary branches naturally being divided between the two ligatures. I think it is always wise in performing the operation to continue the incision along the anterior border of the sternomastoid muscle until it joins the original mastoid incision. It was formerly my practice not to make these two incisions continuous, but I believe the operation is better performed and more easily performed if the incisions are joined, and the resulting scar is certainly no more marked.

While sinus thrombosis is certainly a very grave complication, prompt operative interference yields fairly good results considering the gravity of the condition. Out of 66 cases upon which jugular excision was performed, 19 died and 47 were cured. Many of these deaths were due to complicating diseases. One case was complicated by a brain abscess and one by diabetes. This gives a 28 per cent mortality for the operation. While at the present time I believe that the jugular should always be ligated or excised in a case of sinus thrombosis. I have in my records a total of 97 cases of sinus thrombosis. This includes both cases in which the jugular was ligated or excised and also certain cases in which the sinus was simply opened and the clot evacuated. Of these cases 24 died, giving a mortality of 24.7-10 per cent. At the present time one would hardly think of dealing with a case of sinus thrombosis by simply opening the sinus and turning out the clot, even although free hemorrhage was established from both the distal and proximal ends of the sinus. The danger of dislodging a clot in curetting the lower end of the sinus makes me believe that it is wise to at least place a ligature around the vein in every case where the sinus is interfered with. The statistics, however, before this opinion became universal are rather interesting.

The third intracranial complication is an abscess of the brain. Such a purulent focus may be located either in the cerebrum or the cerebellar. The symptoms indicative of an abscess in the cranial cavity vary according to the stage of the disease and the location of the abscess. The first general symptoms are those characteristic of an abscess in any part of the body. We have a rise in temperature characteristic of local infection and a rapid pulse. This is the stage of invasion and in the large majority of cases it is overlooked. The temperature may rise to 103° or 104° and the pulse temperature ratio be normal. These symptoms may last but a short time, frequently not more than 24 hours. We also have symptoms characteristic of some intracranial disturbance, headache is invariably present, vomiting occurs in fully 50 per cent of the cases and is most common when the abscess is located below the tentorium rather

than when it is located in the cerebrum; the pulse from being rapid gradually becomes slow and the temperature rapidly falls and as the condition advances becomes either normal or in the chronic cases sub-normal. Other symptoms make their appearance due to the particular part of the brain involved. If the abscess is located in the cerebrum and upon the left side, it usually involves the temporo-sphenoidal lobe, and we have as a symptom a form of aphasia which is quite characteristic, in that patients when shown objects are unable to name them, but they can tell their use, as, for example, when shown a pencil the patient will say it is something to write with; if shown a key, they will say it is something to unlock the door with, but they are quite unable to remember the name of the object. This symptom, of course, is characteristic of the involvement of the first and second temporal convolutions and renders the diagnosis easy. On the other hand, if the abscess is located upon the right side these aphasic symptoms do not exist excepting in left-handed individuals and among these very rarely. If the abscess is located in the temporo-sphenoidal lobe on the right side the diagnosis must be made on the history of the period of invasion, the persistent headache, and vomiting and the slow pulse. A differential blood count is also of value in making a diagnosis. The polymorphonuclear count is usually high, above 80 per cent, while the white cell count is usually fairly high, say from 15,000 to 16,000. The temperature may be slightly elevated or may even be sub-normal. It will be seen that the pulse, the temperature and the differential blood count aid us materially in diagnosis. Choked disc is fairly common, but is sometimes entirely absent. This is also a confirmatory sign. The patellar reflex is usually increased and the motor track is seldom involved in otitic abscess lying above the tentorium. Also occasionally the sixth nerve may be paralyzed, giving rise to internal strabismus.

If the abscess is located below the tentorium the symptoms vary somewhat according to the avenue of infection. Vomiting is always a prominent symptom in cerebellar abscess and vertigo is also a prominent sign. Nystagmus is frequently present and the quick movement of the eyes ordinarily directed towards the affected side. Muscular weakness is always on the affected side in cerebellar abscess. If the invasion has been made through the labyrinth and this is the most common route, the presence of a dead labyrinth to the caloric test and nystagmus to the diseased side form a very valuable aid in the diagnosis. This aid is particularly valuable when we have been able to observe the case for some time prior to the development of the abscess. The nystagmus to the healthy side characteristic of a dead labyrinth suddenly changing to a nystagmus to the diseased

side is almost certainly indicative of a purulent collection below the tentorium. The other symptoms, such as the pulse, temperature, headache and changes in the optic papilla, are the same as those enumerated in considering abscess above the tentorium. If the invasion of the cerebellum has been through the lateral sinus rather than through the labyrinth this symptom of nystagmus towards the diseased side in the presence of a dead labyrinth may not exist.

The treatment of the condition is naturally always surgical. We know from autopsies that in certain cases brain abscesses become encysted and the patient may die of some intercurrent disease. Such cases, however, are very rare and operative treatment should be instituted as soon as the diagnosis is made.

Considerable discussion has taken place as to the method to be employed in opening either a cerebral or cerebellar abscess. In cases of abscess of the cerebrum where the symptoms are definite the best results have been obtained by opening the abscess along the avenue of infection. If the route of infection can be discovered the results of the operation are certainly much better than if the brain is explored through a healthy dural area. The reason for this is that the arachnoid space is obliterated for a certain distance around the avenue of infection and if the abscess is entered along this tract subsequent meningitis from infection by pus from the abscess does not occur. On the other hand if no avenue of infection can be found, as evidenced by a discoloration of the dura after free exposure of the floor in the middle fossa through the mastoid wound, it is then much better if time permits to do a two-stage operation, first doing a decompression operation in the temporal region through the healthy dura dividing the dura and packing the sub-dural space with iodoform gauze so as to cause the obliteration of the arachnoid space. Twenty-four hours after this decompression the temporo-sphenoidal lobe can be explored thoroughly. If the abscess is found the danger of meningitis from infection from the contents of the abscess is materially lessened. Moreover, the decompression operation relieves the intracranial pressure and the dangerous symptoms of which it is the cause. The relief of the pressure in one particular point over the abscess probably favors the pointing of the abscess in this direction. Whichever method is followed the exploration of the brain substance should be made with a grooved director, rather than with a syringe, as the pus is often too thick to flow through the syringe. After the abscess cavity has been entered the wound in the brain substance should be enlarged by carrying a pair of closed forceps along the director, then opening the blades in the cavity and withdrawing the instrument, thus enlarging the opening. I then

ordinarily separate the lips of the brain wound with a pair of thin, light retractors. This allows complete evacuation of the abscess cavity, the broken down brain tissue being gradually expelled by expansion of the healthy brain tissue. If a suction apparatus is available it is very useful in cleaning a case of this kind, the suction tip being introduced into the opening into the brain and removing all pus and brain sloughs. After the cavity has been evacuated my usual practice is to put in a cigarette drain, and leave it in position for 48 hours. At each subsequent dressing the drain is removed and replaced by a smaller one, until the cavity is completely obliterated. In certain cases which are very foul, the use of Dakin fluid is indicated.

In the treatment of cerebellar abscess the same general rules are followed out. Bearing in mind that in the majority of cases of cerebellar abscesses the infection is almost always through the labyrinth an attempt should always be made in opening an abscess to remove the posterior surface of the petrous pyramid and inspect the dura in front of the sinus. If necrotic dura is found the cerebellum may then be explored through this area. In some cases it is manifestly impossible to obtain space enough in front of the sinus to drain a cerebellar abscess on account of the far forward location of the sinus. In such cases it would be necessary to explore the cerebellum behind the sinus. In cases where infection of the cerebellar substance has taken place through the wall of the lateral sinus, drainage of the abscess directly through the obliterated sinus is a method of choice. When the abscess is large, even although it is opened in front of the sinus, drainage through this anterior opening may be insufficient, in which case a counter-opening is made behind the sinus and through and through drainage established. If the symptoms are not sufficiently severe to contra-indicate a 24 hour interval it is better, in cases where the route of infection cannot be found, to expose the cerebellar dura behind the sinus, incise the dura by a crossed incision and obliterate the sub-dural space by packing in exactly the same manner as has been advised in the treatment of cerebral abscesses, where the route of infection could not be found. Some observers, notably Ballance, who was the first, I think, to suggest the procedure, advised deliberate obliteration of the lateral sinus, even although the sinus be normal, and exploration of the cerebellum through the sinus area. Certain devices facilitating the obliteration of the sinus have been devised by Eagleton and others. It is probably quite as simple, however, to pass two deep sutures around the sinus, one just below the knee and the other just above the bulb, and to tie these over gauze plugs lying on the outer

wall of the sinus. This obliterates the sinus completely and the sinus can then be opened and the cerebellum explored. In all cases of suspected cerebellar abscess where the route of infection cannot be determined the procedure suggested in the treatment of cerebral abscess should be employed where time permits. The technique is modified by exposing the cerebellar dura behind the sinus, over a considerable area, incising the dura and obliterating the sub-dural space by packing. The cerebellum can then be incised 24 hours later and the substance explored. The technique is exactly the same as that given under the treatment of cerebral abscess and need not be repeated.

Naturally a brain abscess is a very serious condition and the results from operative interference are far from satisfactory. Cerebral abscess has in my hands yielded better results from operative treatment than cerebellar abscess. Twenty-four cases of brain abscess have been observed and operated upon by me. Of these 14 died and 10 lived. Nine of the cases which lived were located in the cerebrum and one was located in the cerebellum. The cerebellar case which lived, died several years later from a recurrence.

The last complication which we have to consider is meningitis of otitic origin. For convenience cases of this kind may be divided into two classes, serous meningitis and purulent meningitis. The term, serous meningitis is naturally a bad one and applies to cases presenting mild meningeal symptoms, in which the spinal fluid contains no pathogenic organisms, but is under pressure upon lumbar puncture. It undoubtedly represents a mild infection of the meninges, either due to some pathogenic organism or possibly to the toxins produced by pathogenic organisms. It is a condition always present in the early stages of purulent meningitis and may terminate favorable or may go on to the purulent form. The symptoms present in both serous and purulent meningitis are identical excepting that in purulent meningitis the symptoms are much more marked. While in typical cases the diagnosis is easy, there are certain cases in which the diagnosis is extremely difficult, especially in the early stages. Temperature is perhaps the first indication in a suspected case. The temperature varies from 102° to 103° in the serous cases, to 104° or 105° in the purulent variety. Headache is always a constant symptom and vomiting usually occurs. Muscular symptoms make themselves evident in a rigidity, usually beginning in the muscles of the neck and later involving the upper and lower extremities. The deep reflexes are exaggerated and the Kernig sign and the Babinski sign are present and occur quite early. The pulse temperature ratio is usually normal, that is, with a high temperature we

have a rapid pulse. The temperature usually remains constantly high and the daily remissions in typical cases are not greater than two or three degrees, usually between one and two degrees. Paralytic symptoms may occur early and ordinarily affect the sixth nerve, an abducens paralysis being a very common symptom. This usually occurs first upon the side of the aural lesion, but may be bilateral, and in some cases may affect the opposite sixth nerve. Third nerve involvement is not uncommon, giving rise to a contracted pupil early in the disease, later followed by dilatation of the pupils. Inequality of the pupils may be present on account of the unilateral invasion of the third nerve. Changes in the ocular fundus are usually present and vary from slight congestion and tortuosity and dilatation of the veins to a typical choked disc. Photophobia is very frequently present, but is by no means a constant symptom. The sensorium in these cases may be normal until the patients pass into a coma which immediately precedes a fatal termination. In some cases active delirium is present, although this, in my experience, has been the exception rather than the rule.

These represent the typical cases of meningitis. Unfortunately we have a large number of cases in which many of these symptoms are wanting. The temperature may not run very high and there may be marked remissions in the temperature. Coincident with these remissions in temperature we usually have an amelioration of symptoms, the rigidity becomes less marked, the headache less severe.

The differential blood count is of value in arriving at a diagnosis. The leukocyte count is usually very high, say 20,000 to 30,000, while the polymorphonuclear count is always high, 90 per cent of polymorphonuclear cells frequently being found. In serous meningitis the leukocyte count is not as high, and the polymorphonuclear percentage is lower. Globulins are always present in the purulent variety and the reactions of the spinal fluid become acid instead of alkaline. This change in the reaction of the spinal fluid usually occurs very early. The Fehling reaction usually disappears quite early. The cell count is always high, being always higher in the purulent form of the disease than in the serous form. In the serous form of the disease the fluid is practically clear, but as the number of cells increase the fluid rapidly becomes turbid. A bacteriological examination of the fluid is negative in the serous variety, but in the purulent variety shows the micro-organisms causing the infection. Where these organisms are present in large numbers they may be found in a smear of the spinal fluid. Where less numerous they only appear upon cultivation.

We thus see that in considering cases of meningitis of otitic origin the diagnosis is not always simple and the disease frequently runs an atypical course. In the classical cases the diagnosis is easy and a fatal termination usually occurs within four or five days. In the atypical cases the disease may last for several weeks and this is particularly true of those cases where operative interference has been instituted.

The treatment of the condition is most unsatisfactory. Meningitis has been and is still the one infection in which the otologist feels that very little can be done. I think it is unfortunate that this view has been so universally accepted. While the infection is the most serious with which we have to deal, certain cases do recover, even though the spinal fluid contains living micro-organisms. While these cases are very rare a sufficient number do occur to make it imperative for the surgeon to use every effort in his power to bring about a favorable termination and not to fold his hands after he has made a diagnosis of meningitis and allow the patient to die without giving him every possible chance of life.

Concerning the use of drugs and of the various antitoxins and sera, very little can be said. My impression is, however, that a certain amount of benefit is obtained in the internal administration of urotropin in large doses. The drug should be given in doses of at least 60 grains in 24 hours to the adult, and in corresponding doses to the child, the urine being watched daily so as to reduce the dose in case any kidney irritation is being caused by the drug. I have injected the drug into the spinal canal, but have not had favorable cases, although one or two of these have been reported by others. The same remarks apply to the intraspinal injection of the various sera. These have been valueless in my experience.

The operative measures to be employed and which have been followed by the best results in my hands are, first, a complete clearing out of the primary purulent focus either by a simple mastoid operation in acute cases or by a radical operation in cases of chronic middle ear suppuration. In addition to this eradication of the primary focus, I have obtained cures in a number of cases by exposing very large areas of dura in the middle cranial fossa and in the cerebellar fossa. In one case in particular a child was blind, and the spinal fluid was under high pressure, although no micro-organisms were found in the fluid. In this case a simple mastoid operation with a large exposure of the dura in the temporal region and a large exposure of the dura behind the sinus was followed by a complete cure, and the eyesight became normal. Quite a number of cases of this kind have come under my observation and have been operated

upon either by myself or by my assistants. In one case the spinal fluid contained between two or three thousand cells and pneumococci were found on cultivation. This case made a complete recovery. Other cases of this kind have occurred in my hospital service and with such frequency to convince me that in all cases the outcome will not necessarily be fatal. In conjunction with this operation, frequent lumbar punctures should be made and intracranial pressure reduced when it becomes excessive. The more I see of meningitis the more I am convinced that lumbar puncture is too infrequently employed as a curative measure. I am convinced from long experience that large dural exposures and repeated lumbar punctures prolong the lives of these patients. In one where the streptococcus capsulatus was demonstrative in the spinal fluid the patient lived two weeks after the inception of the symptoms and almost immediate exposure of the dura, coupled with repeated lumbar punctures. In a fatal case where streptococci were found in the spinal fluid this plan of procedure was followed and the child lived four weeks after the operation, was conscious until the very end, seemed to be suffering no pain and the only indications that we had that the patient was actually suffering from meningitis were the temperature elevation and the character of the spinal fluid. In this case the rigidity had completely disappeared at the end of two or three weeks and only two days before death the child was sitting up in bed and playing with his toys. If interference of this character can prolong life to this extent it seems to me that probably in the near future we may find some other step which will prolong it still further and probably effect a complete cure.

Good results have also been reported by Dr. Crockett of dural incision, that is, the performance of a decompression operation and establishing subdural drainage. I reported a case of this kind many years ago in the *American Journal of Medical Sciences*, where this plan was followed and the patient was alive at least ten years after the operation. Subdural drainage and subtemporal decompression have not been successful in my later cases, however, and I rarely now incise the dura and although I do this in certain cases, as before stated, the results have not been satisfactory at my hands. Where the lumbar puncture yields negative results and yet there are signs of intracranial pressure drainage of the lateral ventricle should be thought of. In one case seen recently where the patient was "in extremis," lumbar puncture was negative, yet a needle plunged into the lateral ventricle drained off easily two ounces of fluid. Had the puncture been adopted earlier I am inclined to think that the outcome might have been favorable.

The procedure of exposing large areas of cerebral and cerebellar dura in the regions mentioned applies to cases of meningitis where the labyrinth remains active. In many cases of otitic meningitis the invasion of the meninges occurs through the internal auditory meatus and in these cases the labyrinth on the affected side is dead. In the presence of a dead labyrinth subdural drainage may be effected by a complete extirpation of the labyrinth according to the Neuman method, continuing the removal of bone down to the internal auditory meatus. I have modified this procedure so as to give a wider exposure in this region by taking away the superior semicircular canal, thus opening up the vestibule on its superior aspect. This gives complete drainage of the labyrinth and exposes the triangular meningeal area down to the internal auditory meatus. Incision of the dura in this region, with the insertion of a folded strip of rubber tissue effectually drains the subdural space in this region and as this is the avenue of infection, the early performance of this operation would seem to hold out a reasonable amount of hope. Unfortunately, I have had no successful cases. In a case seen in consultation with one of my colleagues, however, this plan was followed and at my suggestion the wound was thoroughly Dakinized. In this case the dura had been incised and a large hernia of the brain was present. This patient apparently made a complete recovery and was well for six months after the operation. The wound in the dura, however, did not heal and a discharge of cerebrospinal fluid continued from the ear. Further operation for the closure of this fistula was refused and the patient subsequently died from reinfection. The point which I would try to impress upon everyone who does me the honor to read this article is that occasionally a case of meningitis is saved. The fact that most of them die in spite of operation should not deter us from making every effort to save the individual case and for this reason I urge operation in every instance where this condition exists.

In closing this article I beg to say that I have given but a fragmentary consideration to each of these various complications. I have made no attempt to go extensively into symptomatology, as this would be impossible in the limited space which this article must occupy. Moreover, all of my readers are probably quite as much acquainted with the classical symptoms under consideration as am I. I have, therefore, simply mentioned the symptoms and have attempted rather to give the results of personal experience of nearly thirty years in dealing with each condition, rather than write upon each condition in detail.

15 East 53rd St.

AN ACOUSTIC METHOD FOR TRAINING THE DEAF.

DR. MAX A. GOLDSTEIN, St. Louis.

An analysis of the origin and development of an educational idea is often a complicated problem, but a fairly comprehensive retrospect has been presented in an interesting manner by Urbantschitsch¹ in his investigation of the literature and active work accomplished with what he designated as auditory gymnastics more than twenty-five years ago.

HISTORICAL.

The idea to stimulate the auditory mechanism of deaf-mutes by means of acoustic exercises is a very ancient one. Archigenes, in the first century, advocated the use of the hearing trumpet and intensified sound in cases of defective audition. Alexander of Tralles, in the sixth century, and Guido Guidi, in the sixteenth century, advocated the stimulation of a latent hearing function by the production of various noises and loud shouting in the ear.

In 1761 Ernaud² demonstrated before the Academy of Sciences in Paris a method by which the deaf were taught to differentiate various vocal sounds, but this applied to that selected class of the deaf who still had residual hearing and comprehension for vowels and consonants. By means of exercises this investigator was able to develop in such pupils with residual hearing for elementary sounds a hearing for words. In one case, he even obtained hearing for phrases. Ernaud claimed that total deafness did not exist. In 1767 Pereire³ claimed that nearly all deaf subjects could be trained to hear words providing some remnant of hearing could be determined at the onset in each given case. Pereire used a peculiarly constructed hearing trumpet.

The first substantial and scientifically logical accomplishment in this field of auditory stimulation was developed in 1802 by Itard,⁴ an eminent otologist of Paris. This keen observer found, in a group of deaf-mutes, by frequently and regularly repeated vocal sounds called into the ear, that an increased hearing perception could be uniformly developed. In 1805 he carried out a series of careful observations in a class of six deaf-mutes. Itard began his acoustic practice with bells, gradually reducing the tone intensity of this source of sound. He then substituted musical tones, the rhythmic beat of the drum, the sustained notes of the flute, and, finally, the

¹Address presented at the Joint Convention of the Three National Associations of Instructors of the Deaf at Mt. Airy, Pa., June 2, 1920.

five elementary sustained vowels and the production of consonants. Three of these cases received daily practice for one year. His conclusions were as follows: In the one case where the sound of thunder and intense gongs were heard before the practice, word-hearing was developed; in the second case where residual hearing for elementary sounds existed, word-hearing was developed; the third case, whose residual hearing was far better than the first two cited cases, did not respond satisfactorily and as an end-result showed less progress than the other two.

This attempt by Itard to develop systematic auditory exercises was continued after his death in 1832 by Blanchet,⁵ who added speech and various musical instruments to these exercises; Deleau⁶ declared himself in favor of such acoustic exercises in the education of deaf-mutes. The teachers of the Institute for the Deaf at Nancy followed in the wake of these French investigators.

Beck, Jager, Wolff, and Frank interested themselves in this phase of special training in Germany.

The following quotation from Itard's monumental work, "*Traite des Maladies de l'Oreille*," is of interest:

"Musical tones must of themselves serve as an agent to restimulate the defective action of the auditory nerve and awaken its functioning possibilities. Sound vibration is the most valuable stimulation for the ear and a reawakening of the auditory sense cannot be accomplished without its application. We may employ musical apparatus producing intense tones; we may utilize the drum where the grade of deafness is more marked; we may apply the sonorous tones of a bell in intense or mild degree to stimulate the auditory nerve. In deafmutes, where complete deafness does not exist, all tone accessories must be consistently and persistently applied."

In England, Toynbee⁷ and Wilde⁸ took up this question.

Toynbee emphasizes the importance of auditory exercises in all deaf pupils with residual hearing. I quote from Toynbee's careful observations as follows:

"It would be very interesting to know how far the facts respecting the hearing power of so-called deaf and dumb children are corroborated by the observations of others. Itard hazarded the opinion that one-half of the pupils at the Deaf and Dumb Institution at Paris were wholly deaf, and that the other half heard some sounds."
* * * "If there exists throughout the deaf and dumb in England relatively as many cases of a large amount of hearing as in the London institution, steps taken to improve the hearing power might be productive of the most valuable results; especially as my own limited experience warrants the assertion that this power is capable of considerable development."
* * * "The treatment calculated to improve the hearing consists in the use of trumpets whereby the nerve apparatus may be gradually excited as to become sensitive to ordinary sonorous undulations and external stimulants. While quite agreeing with Wilde that we cannot hope to cure cases of deafmutism, I still think, when there already exists the power to hear the vowels so distinctly as to distinguish and repeat

them, that from the exercise of the ear considerable improvement may reasonably be anticipated; sufficient, in fact, to aid in carrying out the end above all things to be desired, viz., the exercise of the organs of speech."

"But the great advantage of calling forth the auditory power of so-called deafmutes is, that they may be enabled to hear their own voices, and to modulate them, for the extreme harshness and monotony of the sounds produced by deafmutes arises from the impossibility of regulating the tones of a voice which they cannot distinguish."

Toynbee cites, from his own experience, three cases of residual hearing in which marked improvement followed constant practice with vocal sounds (elements, words and sentences). In the description of these cases he comments at length on the character and quality of voice employed in practice, the type and degree of deafness of the individual cases before the exercises were undertaken, and a comparative summary of results after a definite period of such training. One of the very unusual conditions in Mr. Toynbee's three cases is that one pupil was a young woman between twenty and thirty, the second a young woman of twenty-three and the third a gentleman of seventy. The unusual inference to be drawn from these cited observations is the possibility of stimulating the auditory nerve even of adults and in one case in a man of seventy.

Gradually the interest in this form of special education of residual hearing, as advocated so enthusiastically by Itard, Toynbee and others in the early half of the nineteenth century, began to wane. To America belongs the credit for a reawakening of this form of special training of the deaf. In 1884 Gallaudet⁹ devoted much time and thought to this work of stimulating audition in the semi-deaf. Currier¹⁰ in New York followed with some modifications in an endeavor to train small groups of the semi-deaf, using multiple conversation tubes. In 1892 J. A. Gillespie¹¹ of the Nebraska School for the Deaf presented an interesting paper on Aural Instruction to the American Association. Gillespie states:

"Aural instruction is the training of the partial hearing of that class of our deaf population, which we call semi-deaf, to perceive sound." * * * "I wish to be understood by this term as meaning—teaching semi-deaf children to hear, of understanding English language addressed to the ear. * * * This matter pertains, of course, to a limited number of the deaf. * * * In the former estimates of the number of persons who could be benefited by this plan, 15 per cent was considered fair."

From Gillespie's quoted statements, I am justified in the conclusion that his work and results with aural instruction were obtained exclusively with the semi-deaf.

I quote again from W. E. Taylor¹² of the Nebraska School, where much attention has been directed toward this special form of instruction, as follows:

"At the end of the first month's work the class were able to speak, hear or lip-read and write: I love you, I love my papa, I love my mamma, I love my home, Are you well, You have a ball. * * *"

This citation also applies exclusively to the semi-deaf, for no totally deaf child has yet been taught by any method devised to hear sentences of two or three words in the course of one month's practice.

At this period an American Committee was organized consisting of Messrs. Alexander Graham Bell, Gordon, and Clark. This committee, after a careful investigation of the work of Itard, commended this eminent authority's idea of restimulating or awakening impressions in the auditory apparatus by means of sonorous vibration of various sources.

Desultory attempts to apply auricular training have been made by teachers of the deaf in America and in Europe since the reawakening of this idea by Gallaudet in 1884, but the most profound investigations and actual accomplishment in this field must be credited to Victor Urbantschitsch of Vienna. In 1892 Urbantschitsch enlisted the interest of the authorities of the Döbling State Institute for the Deaf in Vienna. He presented his plan of work to the Principal and Senior Instructor of this school and arranged for daily practice with a group of pupils in this school. The cases selected for this practice all received functional hearing tests and were classified as totally deaf, as they gave no response to any hearing tests applied. These pupils responded negatively to all tuning-fork tests by both air and bone conduction and were unable to distinguish any sound perception when sustained vowels were called loudly into the ear, nor could they hear musical tones of any character. In 1893, Urbantschitsch presented his first scientific announcement of the value of such auricular training and, in December, 1893, the first practical public demonstration of his work was given at the Medical Association of Vienna.

During the fall of 1893, I was doing post-graduate work in Vienna, and it was my privilege and good fortune to attend with Professor Urbantschitsch his daily observations and practice at the Döbling Institute for the Deaf and to be present at this first demonstration to the Vienna Medical Society. I recall the interest of the assembly on this occasion, the skepticism of several distinguished authorities, the challenge of the status of total deafness of the pupils demonstrated, the refutation by Urbantschitsch in his determination of complete deafness preceding the period of practice in most of the pupils demonstrated, the excellent response by the

HISTORY OF CASE.	HEARING CAPACITY, JUNE, 1895.	HEARING CAPACITY, APRIL, 1897.
Nellie S., et. 25 years. Lost hearing when 4 years old, the result of typhoid fever. No family consanguinity; no deaf relatives.	Falls to hear sound of voice under any circumstances. Tuning fork tests nihil.	Hears a, o, oo, and differentiates these sounds in all possible combinations.
Maud H., et. 11 years. Lost hearing 3 years ago. Cause: suppurative otitis media following "grippe."	Hears voice slightly at close range. Is unable to differentiate. All sound impressions apparently alike.	Differentiates a, e, i, o, u, when spoken in moderately low voice. Hears numbers from 1 to 6. Voice tests at 18 inches.
Sadie T., et. 12 years. Lost hearing when three months old, the result of cerebro-spinal meningitis. Family history good. Has a bright and lively, though nervous temperament. Strumous diathesis.	Hears voice at close range. Sounds heard are confused and indistinct. Adenoid vegetations; hypertrophied tonsils, drums slightly opaque and retracted.	Differentiates a, e, i, o, u, with ease at 1 foot from ear. Hears short words. Hears numbers 1 to 20. Can determine high and low pitch.
Della C., et. 14 years. Lost hearing totally when 2 years old. Cause unknown. No parental consanguinity; no deaf relatives.	Tuning fork tests nihil. Falls to hear sound of human voice under any circumstances.	Differentiates accurately all the vowels, a, e, i, o, u. Hears numbers 1 to 5. Hears mama, papa, baby, Dada.
Etta M., et. 11 years. Deaf since 3 months old. Cause unknown. Has a good voice and articulates well.	Hears but few indistinct sounds. Tuning fork in both air and bone conduction slightly heard(?).	Hears vowels accurately. Hears numbers from 1 to 10. Hears many simple words.
Vera P., et. 11 years. Deaf since earliest infancy. Cause unknown. Bright and active. Hypertrophied tonsils.	Partial word-hearing. Differentiates vowels imperfectly. Hears tuning fork by both air and bone conduction very slightly.	Hears and repeats words in quicker succession and with as much accuracy as pupil with normal hearing. Hears and repeats words of polysyllables and also entire sentences of simple words.
Fannie McF., et. 16 years. Deaf, congenital. Has two "congenitally and totally deaf brothers." Some speech impairment due to hypertrophied tonsils, adenoid vegetations, and slight parenthesis of uvula.	Tuning fork test—no air conduction. Hears (?) slight bone conduction, C 128. All other tests fail. Hears but few words, those called at 3 feet range: a-i-o mama, papa, baby. Hears a and o as different sounds.	Carries on a limited conversation at 10 feet range, blindfolded and without aid of slightest apparatus with speaker's voice in ordinary conversation pitch. Hears and repeats short words, and polysyllable words without difficulty. Can determine voice inflection.

HISTORY OF CASE.	HEARING CAPACITY, JUNE, 1895.	HEARING CAPACITY, APRIL, 1897.
Mary F., et. 15 years, born in Penn. No consanguinity of parents; both, however, of irascible temperament. The deaf-mutes are a pair. Older brother and younger sister both deaf-mutes. Congenital deafness.	Tuning fork tests negative. Does not hear loud shouting. Articulates poorly. Speech very indistinct. Voice. Membrana tympani normal.	Differentiates the vowel sounds, <i>a, o, u</i> , when called into ear at close range in prolonged tones. Voice improved.
Annie F., et. 13 years, born in Texas. Sister of Case 1. More active. Deafness congenital.	Tuning fork tests negative. Hearing for shouting voice at close range, nil. Articulation poor. Membrana tympani normal.	Differentiates <i>a, o, u, e</i> at 4 inches from ear. Articulation and voice improved.
Annie K., et. 16 years. Contracted mumps when 5 years old, and deafness dates from that time; probably the sequel. Otherwise well-developed and healthy.	Total deafness; no bone conduction with tuning fork or watch. No voice sounds heard.	Hears <i>a, o, oo, e</i> , with fair ability to differentiate. Range, 1 inch.
Emma H., et. 14 years. Contracted cerebro-spinal meningitis when 18 months old. Deafness followed.	"Total deafness." Tuning fork, watch, voice, Galton whistle, all nihil.	Differentiates all the vowels. Has had several relapses. Voice has acquired more volume.
Mamie H., et. 13 years. History not obtained.	Has vowel hearing, but cannot distinguish pitch.	Left a few weeks after first sitting. Improvement was very marked.
Emma Y., et. 15 years. Lost hearing when 7 years old, as result of a grippe. Family history good.	"Total deafness." Converses fluently by lip reading.	Differentiates <i>a, o, oo, e</i> . Also two and three vowels in close succession, <i>a, e, oo</i> , etc. Hears several numbers, as <i>one, two, four, etc.</i>
Lizzie O., et. 15 years. Cerebro-spinal meningitis when 2 years old, resulting in complete deafness. No deaf relatives; no consanguinity. Has scar over trachea, which is apparently a tracheotomy scar. Patient has no recollection of having had diphtheria or throat complications.	All tests negative. Case one of so-called "total deafness." Voice fair; articulation poor.	Differentiates <i>a, o, u</i> , at 6 inches from ear; can also distinguish <i>low</i> from <i>high</i> pitch of loud voice. Articulation improved.
Julia T., et. 13 years. Lost hearing when 4 years old. Cause unknown.	Tests all negative. Voice thin and high-pitched. Hears nothing.	Hears <i>a, o, oo, e</i> . Differentiates vowels at 4 inches; voice stronger.
Guida E., et. 13 years. No consanguinity of parents. Congenital deafness. Has two brothers deaf-mutes; also deaf-mute relatives on father's side.	Cannot hear voice or other sounds under any circumstances. Hears very loud clapping of hands.	Differentiates vowels quite accurately when called into ear with voice of only moderate intensity.

pupils themselves and the general impression and conclusion by doctors and teachers present of the accomplishment and value of this work. Eighteen pupils were presented and the results shown indicated improvement varying from vowel differentiation to perception of complete sentences. In addition to the practical demonstration, Urbantschitsch presented an analysis of his work and a plan by which such systematically conducted acoustic exercises could be carried on. It must be regarded as an index of unusual promise for oral education and acoustic work that so eminent an authority as Victor Urbantschitsch, Professor Ordinarius in the University of Vienna and Successor to the Nestor and founder of modern otology, Adam Politzer, has espoused this cause and taken time and interest to make a careful and impartial scientific study of its merits and possibilities.

R. Marage¹³ of Paris has contributed much interesting data to this question. He utilized a specially constructed siren in which motor-driven, compressed air produced the vowels a—e—i—o—u as fundamental vibrations without overtone. The volume of sound was measured by a delicate manometer and this siren was found to be a reliable instrument for measuring the acuity of audition. Not only was this siren utilized for measuring acuity, but by phonomassage the hearing perception in classes of deaf-mutes to whom it was applied at the school at Bourg-La-Reine was materially improved. This acumeter received the Barbier Prize in 1900, and it is to be regretted that so little has been known of its practical application elsewhere.

My personal enthusiastic interest and support in the efforts of Urbantschitsch and my participation in the daily practice of the Döbling Institute, while these exercises were being tested out and carefully studied, was rewarded by the request of Urbantschitsch that I introduce his work in America. It was a difficult task. On my return home I submitted the matter to the Superior and teaching Sisters of the Saint Joseph School for the Deaf in St. Louis. Even though this was at the time an almost purely sign school, I am glad to say that they offered me every opportunity for study and development with their pupils and the Superior and several of her progressive teachers co-operated with me in carrying out these exercises. A class of sixteen girls ranging in age from six to eighteen years was placed at my disposal. I arranged for daily practice with each pupil. The teachers in charge of this auricular practice were instructed how to proceed from step to step. Each

pupil received fifteen minutes practice daily. I supervised this work by visits to the Institute two afternoons of each week through a period of two years. In April, 1897, I demonstrated the results of two years' work with the Urbantschitsch auricular exercises before the American Academy of Ophthalmology and Oto-Laryngology¹⁴ in St. Louis. As a matter of record I here include my summary of this demonstration and a brief history of the status of deafness of each pupil before the exercises were begun and the improvement recorded after two years' work.

Then came an unfortunate lapse of years in pursuing these investigations due largely to my own pre-occupation in medical practice and to a lack of opportunity to continue my observations at the St. Joseph School. Another unfortunate circumstance was that the demonstration of this acoustic training was presented to my own oto-laryngological colleagues rather than to a group of progressive teachers of the deaf. I cannot refrain from making the fair comment of the unresponsiveness which I have found for nearly a quarter of a century in my efforts to arouse the interest and co-operation of the otological profession of America. But the dawn comes after darkness, and I am happy to say that within the past few years there has been an awakening among my own colleagues to the importance of the question involving the education and status of the deaf. It will be a proud moment in my life when the united strength, influence and ability of the medical profession has been brought to bear on the study and uplift of the deaf.

Another opportunity in our activities with acoustic exercises was created with the founding of the Central Institute for the Deaf in St. Louis in 1914. The principles and practice of acoustic training have always impressed me as being thoroughly sound and scientifically logical and as my association with the actual pedagogy of the deaf became more intimate, I began to wonder why such a method was not more generally applied, why institutions and teachers throughout the land were not more enthusiastic about it and why the unusual and satisfactory results of Urbantschitsch abroad and of the work at the Wright Oral School and of the Central Institute for the Deaf at home could not be duplicated by other teachers and many groups of pupils. After a careful analysis of every factor considered in such a special pedagogy, I came to the conclusion that the causes were: lack of information of this work by the teaching profession; lack of available literature, and, finally, lack of a practical and detailed working system.

I propose to place this question of adopting an acoustic method in your regular pedagogy for impartial consideration by submitting all literature and references; by presenting an analysis of our observation and experience in the application of this method and by offering a systematic series of exercises with charts and directions so that every teacher may have data at command for an acceptable and comprehensive plan of work.

OTOLOGICAL.

Otological science throughout its various periods of development has dealt with the question of deafness from many angles, principally, however, as practical issues in the application of medical science. Deafness has been voluminously discussed as caused by tangible diseases of the ear and of the general system; it has received much attention from the standpoint of acoustics and applied mechanics, including aids to hearing of many variations, ear trumpets, conversation-tubes, artificial drum-membranes, audiphone, dentaphone, and electrical devices based on the combination of principles of the telephone, megaphone and microphone—all have been given consideration and have had their spasms of interest and enthusiasm. These mechanical devices are all based on the principle of acoustics for intensifying, amplifying and conducting sound-waves to a physiologically defective hearing apparatus.

Otologists and physiologists have classified the defective mechanism of audition in the human ear into two general groups: (a) diseases affecting the conducting-apparatus of the ear; (b) diseases affecting the perceiving-apparatus of the ear. The conducting machinery of hearing is a mechanical problem and concerns itself with the normal status of the external ear, the character of the drum-membrane, the functioning capacity of the ossicular chain and the ventilating qualities of the Eustachian tube. These are mechanical factors and much has been done in the development of the medicine and surgery of otology to correct and restore defective hearing where such mechanical principles were involved.

A monumental accomplishment in otology was the discovery of the presence of adenoid vegetations by Wilhelm Meyer, an elderly general practitioner in Copenhagen, Denmark. When his classic monograph describing the presence of adenoid growths in the naso-pharynx, their baneful influence on the general development of child-life, their special contribution as a causative agent to serious deafness and the means for their surgical removal, was first presented at a meeting of the Royal Medico-Chirurgical Society in Glasgow, Scotland, this

venerable author and keen observer was figuratively hissed out of the assembly. It was at least two years after this memorable presentation before the medical profession was ready to accept and apply this valuable discovery. Until the discovery of adenoids by Wilhelm Meyer, a large percentage of pupils in schools for the deaf throughout the world suffered from this neglected overgrowth of lymphoid tissue in the naso-pharynx and consequent deafness. At one time, it was reported that the presence of adenoid growths was responsible for the deafness of over twenty per cent of the children in a group of schools where a careful examination as to the cause of deafness had been directed. The cause of this deafness has since been proven to be the presence of such adenoid tissue in the vault of the pharynx, overlooked and neglected because unknown and by virtue of such oversight and neglect adhesions and children in a group of schools, where a careful examination as to obstructions the Eustachian tube were formed, the air supply and ventilation of the middle ear cavity choked off, the drum membrane and chain of ossicles violently contracted, adhesions of the membr. tymp., ankylosis of the small joints and fixation of the footplate of the stapes involving this delicate physiological mechanism followed and permanent deafness of varying severity and degree resulted.

When I began the active practice of otology in St. Louis, the first operations for the removal of adenoid tissue were being performed here. This was an epoch in otology and one of its most important contributions toward the uplift of the deaf child. In modern otology, many valuable contributions have been made to combat and relieve diseases of the ear, which threaten deafness from possible pathological complication. The mastoid operation has been perfected technically to guard against further invasions of the hearing mechanism; tonsil enucleation offers a solution, to many toxic and systemic infections causing deafness; submucous and plastic surgery of the interior of the nose removes obstructions and corrects faulty ventilation through the Eustachian tubes; the mucous membranes of the nose and throat are carefully treated in cases of the eruptive fevers (scarlet fever, measles, etc.) to prevent extension of these infections to the ear; the discovery of the bacillus of meningitis and its invasion via the nose and throat sounds a note of warning; the splendid contributions of the Vienna otological group to the physiology and pathology of the labyrinth offer us a better understanding of auditory functions—these are some of the recent contributions to otology and preventive medicine toward the control and arrest of deafness.

CLASSIFICATION OF CLINICAL TYPES OF DEAFNESS.

Group I. LYMPHATIC TYPE.

Lymphatic diathesis with hypertrophied tonsils, adenoids in the naso-pharynx, lymphoid nodules throughout the upper respiratory tract, pale and soft Schneiderian membranes with tendencies to frequent and various aerobid infections whereby a mechanical blockade of a more or less permanent character is developed in the tubo-tympanic tract, tissue metabolism changed and the functions of the conducting apparatus of the ear impaired.

Functional tests usually corroborate the clinical diagnosis of impairment of the sound-conducting mechanism.

With the better comprehension of the pathology and surgery of Waldeyer's lymphatic ring, much of the evil aftermath in this group has been held in abeyance. Prompt intervention not only removes mechanical obstruction to ventilation and sound-conduction, but also prevents the more serious adhesions, retractions, contractions and absorptions in the tympanic and tubo-tympanic areas where severe and permanent deafness may ensue.

Group II. EXANTHEMATOUS TYPE.

As most of the exanthematas have their focal infection in a specific angina and as the local invasion so frequently includes the ear tract, we have a ready accounting for the frequency with which suppurative processes invade the tympanic cavity in this group. These suppurations seem to be of a specially destructive type for the membrana tympani is often sloughed in a large radius, the ossicles necrosed and the walls of the tympanic cavity eroded. Similar erosions are found about the fenestrae ovali and rotundae and these lead to permanent ankylosis or bony changes in this part of the labyrinthine wall.

It is a significant fact that many children with total deafness date their misfortune from an intense invasion of an exanthematous fever. Close observers have concluded that such invasions carry with them not only a destructive process centered in the tympanic cavity, but a toxic, selective attack on either a part of the labyrinthine structures, ramus cochlearis, or localized meningitis.

Careful functional tests in this group reveal impairment of both low and high ends of the cochlear scale and often simulate the clinical tests of oto-sclerosis. There is this difference, however, between an incipient oto-sclerosis and an exanthematous invasion of the labyrinth: in oto-sclerosis the basilar and apical Corti cells are involved and a large part of the central scale still functions; in some

types of exanthematous invasion of the labyrinth the cochlear cells may be intermittently and irregularly attacked, producing definitely recognized and still functioning tone-islands throughout the cochlear scale.

Group III. CENTRAL TYPE.

In epidemic meningitis, poliomyelitis and exanthemata with intense febrile reaction, we frequently find a sudden attack on the auditory central organ and total deafness. The following brief clinical report will illustrate: An intelligent, normal girl of sixteen was attacked Christmas day by epidemic meningitis with all of the characteristic symptoms of this infection; was seriously ill for a week, joined the family at dinner New Year's day recovered from meningitis but totally deaf. Here again we note a selective localized meningeal attack on the nerve trunk.

Functional tests with all forms of sound-producing apparatus, including tuning forks, voice, musical instruments and gongs failed to produce any sound impression. Even if the labyrinth end-organ has escaped attack, if both auditory nerves in their trunk have been toxically invaded and destroyed, the deafness must be complete.

Group IV. OTO-SCLEROTIC TYPE.

Much has been written about oto-sclerosis, but we are still undecided as to its pathological entity. As it occurs less frequently in the child and the youth than in adult life, it does not figure to so large an extent in the problem of residual hearing and its development.

There are several clinical and pathological data which seem fairly constant in this group. We have every reason to believe that a spongifying or sclerotic change in the labyrinthine capsule takes place; the point of most frequent attack seems to be about the foot-plate of the stapes; the membrana tympani frequently shows no change in plane or lustre other than a circumscribed pink spot at the promontory; the tuning-forks and Galton whistle give evidence of a diminished perception for both low and high tones; bone conduction is prolonged beyond the normal and a paracusis is usually present in incipient cases.

Group V. THE CONGENITAL TYPE.

One of the most serious factors in the production of profound deafness is that of congenital transmission. Interesting statistics have been compiled showing the large percentage of total deafness evolved in the matings of the congenitally deaf and of consanguinous

marriages. We are here concerned not with a pathological but with a biological question. At a former meeting of the American Otolological Society, I showed among a series of microscopic sections of the labyrinth, one of a congenitally, totally deaf child. The most interesting phase of this specimen was that the cochlear nerve in the labyrinth was shown to consist of only a nerve sheath and contained no vestige of neuroglia or nerve substance; the nerve presented the appearance of an empty shaft. Or, we may find a congenital atresia or absence of the external ear or of the tympanic cavity or its contents and a consequent undeveloped hearing mechanism. These brief descriptions illustrate my point of a biological absence of tissue rather than a pathological destruction or degeneration.

A functional test with tuning-forks and other sound-producing apparatus in this group elicits no response to any sound-perception, for if the cochlear or peripheral element is absent, no sensory impression can be conveyed to the cortical centrum.

Group VI. HEREDITARY TYPE.

We should distinguish between the congenital type in which a transmissible absence of a part of the auditory nerve mechanism may be found and the hereditary transmission of a degenerative element as in ricketts or syphilis. In syphilis the cochlear nerve or the ramus cochlearis may be present, but may have undergone sufficient degeneration in embryo or in early childhood to present a decided pathological entity.

Functionally such a differentiation could perhaps not be made by sound tests. Here we might avail ourselves of the Wasserman reaction, preferring spinal puncture to blood examination, and it is not unreasonable to hope, if such laboratory findings corroborate a syphilitic diagnosis, that an anti-syphilitic treatment may, even in cases of profound deafness, produce improvement in hearing.

Group VII. BENIGN TYPE.

Impaired hearing caused by recurrent coryza, deflected septum, hypertrophied turbinates, polypi (mucous or fibrous), adenoids, tonsils, malformation of the palate and choanae, chronic suppurative otitis media, large perforations of the membrana tympani, etc., where the mechanical influences of obstruction have not developed permanent secondary pathology, such as adhesions, obstructions in the tube, necroses of the ossicles, partial destruction of the tympanic walls, may be classified as a separate group where the necessary surgical and therapeutic treatment may greatly improve the hearing and restore practical auditory usefulness.

But we are not especially discussing deafness of mechanical origin as affecting the conducting apparatus of hearing. The specific problem with which we are here concerned is that of nerve-deafness—changes in the character of the perceiving apparatus of hearing as they occur either in the central or peripheral nerve-organs of the ear. The literature on nerve-deafness is voluminous; the influence of tuberculosis, syphilis, alcoholism, consanguinity and heredity as a causative agent of such deafness has been described in interesting and valuable papers and monographs; the toxic effects of scarlet fever, measles, influenza, meningitis, whooping cough, typhoid fever and other systemic infections involving the central nervous system, thence the auditory nerve at the base of the brain, have been given much serious attention by many investigators. We confess, however, that the results of all such investigation and research have as yet contributed but little to the tangible and definite explanation of the pathologies that cause the types of supreme deafness with which we are so intimately concerned. From this labyrinthian mass of literature, I have attempted a classification of nerve deafness into five groups, each group representing a different pathological process and a different prognosis when studied in the light of modern pedagogy and psychology.

CLASSIFICATION OF NERVE-DEAFNESS.

Group I—Deafness due to pathological changes in the end-organs or acoustic labyrinth, the tissues of the ramus cochlearis and distributions to the cortical hearing centers in the brain remaining normal. (Labyrinthine Type.)

Group II—Deafness due to pathological changes in the tissues of the ramus cochlearis or distributions to the cortical hearing centers in the brain, the acoustic labyrinth or sensory end-organs remaining normal. (Central Type.)

Group III—Deafness due to congenital absence or arrested development of a part or all of the filaments or branches of the auditory nerve in the acoustic labyrinth, the ramus cochlearis and distributions to the cortical hearing centers remaining normal. (Labyrinthine Type.)

Group IV—Deafness due to congenital absence or arrested development of the ramus cochlearis or its distribution to the cortical hearing center, the acoustic labyrinth or sensory end-organs remaining normal. (Central Type.)

Group V—Deafness due both to congenital defect or pathological change in the ramus cochlearis or its distribution to the cortical hear-

ing center and to congenital defect or pathological change in the acoustic labyrinth or sensory end-organs. (Labyrinthine and Central Type.)

Let us assume that the successful result of our application of sound vibration by persistent use of the human voice or of various musical instruments effects a stimulation and excitation of the acoustic mechanism. In Groups One and Two, such vibratory stimulation may re-educate such special nerve cells and fibers and overcome the paresis acoustica or other toxic or inflammatory handicaps which have been placed on these tissues by some constitutional invasion. I hold that it is even possible in Group Three, where there may be a healthy central auditory apparatus and a congenital absence or deficiency in the peripheral acoustic apparatus, to develop some other avenue of conducting sensory impressions by such special training, and thereby penetrate to the auditory center in the brain by some circuitous route, and disregard the absence or deficiency of the acoustic end organ. If this classification could be definitely determined by careful functional tests, it would make selective pedagogy practically possible, for we could at the outset determine what class of pupils, even those regarded as congenitally totally deaf, could be successfully trained by this acoustic method and what class of pupils we would reasonably suppose to be non-responsive to such training.

From our practical observations with the acoustic method we are justified in the conclusion that pupils for such training need not be selected only from the group of the semi-deaf, but may easily include even those heretofore classified as totally deaf, for it has been our experience that the degree of deafness is not always the criterion of the possibilities of success by acoustic training. Our records will show that some pupils classified as semi-deaf have not progressed as rapidly or as far as some pupils classified as totally deaf.

If the classification of nerve deafness into the several groups above referred to is scientifically consistent and if the results of the application of the acoustic method depend on the stimulation or re-education of unawakened, toxicised or degenerated nerve tissue, we should be in a position to even establish a prognosis in this acoustic training. We may consider the history of the pupil, congenital factors in his case, the character of the disease from which deafness dates, the general physical and mental development of the case and the responsiveness of the pupils to the systematic acoustic exercises. All such data will be of more value in prognosticating

the future of a pupil by the use of the acoustic method than will the degree or profundity of deafness at the time such exercises are first undertaken.

THE ACOUSTIC METHOD.

In literature, we find mention of "An Aural Method," "Auricular Training," "Aural Gymnastics," "Acoustic Exercises," and other titles for this special form of pedagogy which lead us astray by their manifold interpretations and confusion of terms. In the pedagogy of the deaf we have firmly established the Oral Method, the Manual Method, the Combined Method, and now we ask you, if the work here presented is regarded as of sufficient importance and dignity to justify its taking a place with other pedagogic systems, to term this the Acoustic Method. The principles of the Acoustic Method are based on sound-vibration and sound-interpretation through the auditory nerve-apparatus, both peripherally and centrally considered.

PEDAGOGICAL.

It is quite evident that theoretically and practically acoustic exercises heretofore have been directed almost exclusively to the semi-deaf; the pupils regarded as totally deaf have rarely been given these opportunities. Of all authorities who have investigated and developed this work, Urbantschitsch has been perhaps the only one who has persisted in his training of the profoundly or totally deaf child by the acoustic method. I find no literature to permit the conclusion that American instructors of the deaf or investigators into this problem have ever given a fair trial to the totally deaf child by acoustic training.

In planning our course of training by the acoustic method in the Central Institute for the Deaf, we have directed that every pupil in the Oral School shall receive daily systematic training of this character, irrespective of the degree of deafness, the age of the pupil, or scholastic status. We have devised specially arranged, individual record charts and here every step in the progress of the pupil has been noted during the past year. We believe that a careful analysis of these charts and several years more of experience will gradually lead us to develop a comprehensive working system which will enable all instructors to be placed on the same pedagogic plane and all deaf pupils to be given equal opportunity for development by such training.

Let me emphasize again that it is my sincere opinion that the principal reason for the many unsuccessful attempts and indifferent results in the use of the acoustic method are due to the desul-

tory, aimless and unsystematic form of procedure which has discouraged teacher and pupil alike and which has given rise to so many misconceptions and misunderstandings about this particular special pedagogy.

The construction of a graduated, systematic series of exercises and tables, based on the underlying principles of sound-perception by the normal ear, and studied in conjunction with the pathology and psychology of the deaf child, is here offered as a working plan. At the outset, I admit its many imperfections for it is a difficult task to plan a pedagogic system where a vast array of conflicting problems and theories must be faced; where much of the physiology and pathology of the acoustic mechanism is still but vaguely understood; where a comparatively short time for practical study and impartial analysis has elapsed and where large groups of pupils by many teachers with varying degrees of pedagogic skill and different pedagogic ideas have not yet been called into consultation to summarize the end-results and establish its practical potentiality.

The pedagogic data furnished in this monograph and the series of charts and exercises used in the application of the Acoustic Method here described have been presented and elaborated by Miss Lilla B. McKenzie, the teacher in charge of Acoustic Work at the Central Institute for the Deaf in St. Louis, to whom I acknowledge my sincere obligations for this valuable subject-matter and to whose untiring application to this work much of our successful development is due.

We classify our plan of work into (1) Passive Education and (2) Active Education. We term the process by stimulation with musical instruments, a stimulation received by the child without conscious effort on his part, as Passive Education.

To simplify our work and concentrate our observations, we employ two musical instruments at the Central Institute; the harmonium for Passive Education, the human voice for Active Education. The harmonium,* or modified accordion,† which we use has a range of six octaves of whole tones from Contra C to C⁴. The reed used is of the blower-type. This type has been selected because the tone produced by such a reed may be made of more intense volume and with less effort than that of the suction-reed type. The harmonium is supplied with three stops, controlling three sets of reeds of different timbre. It will be seen that through changing the combination of these stops, seven different timbres or qualities of tone may be pro-

*Devised by Urbanschtsch. †Devised by Goldstein.

duced. Timbre is a most important factor in Passive Education, as the employment of various timbres prepares the pupil for a perception and differentiation of the several qualities of the human voice to which he is later subjected in Active Education, and lays the foundation for a more accurate perception of vocal sounds as produced by the many variations of the human larynx. Each tone may be prolonged several seconds thus producing continued excitation of selective areas in the organ of Corti.

All pupils, regardless of the residuum of hearing, should be given at least ten minutes daily instrumental stimulation in addition to the acoustic exercises for developing appreciation of spoken language. This instrumental practice should be continued throughout the entire course of acoustic training, for by its use the entire range of the organ of Corti is constantly subjected to stimulation and inactive or dormant tone islands awakened to greater potentiality. We concentrate on the development of tone-perception within the range of the speaking or singing voice, but in some cases where the pupil shows no perception for tones within this range, we have been able to stimulate such perception by constant application of sonorous vibrations on tone-islands of hearing outside of this range and gradually developing or educating a perception for tones within the range of the speaking voice.

It is difficult to make an accurate test of residual hearing, especially when an instrument producing very intense vibration is used. Older pupils will differentiate between tactile and auditory impressions, but the younger ones can rarely do this. Intense tones are often conveyed directly to the auditory nerve through bone conduction. Every change in the hearing perception of each child is recorded on an individual chart as soon as an observation of the increased perception is made. This chart contains a space for the date of each observation and in this way a chronological record of the pupil's progress is also made. The distance or hearing-range of the individual notes of the harmonium is recorded. In a school year, therefore, we are in a position to submit a chart for each pupil containing the observations of the harmonium tests together with the tone-islands of hearing, distance or range of hearing and dates when such changes were observed in either ear. The whole picture presents a clinical record of Passive Education for sound vibration that may be considered as definite as a clinical record in which pulse, respiration and temperature indicate the course of progress or the physical status of the patient.

TESTS FOR RESIDUAL HEARING.

Name _____ Address _____ Age _____
 Former School _____ No. months in school _____ Grade _____
 Child's Developmental History:

1. Birth Conditions.
2. Congenital or acquired deafness.
3. Early History.
4. Health.
5. Memory.
6. Concentration.
7. Class Work.

		HARMONIUM TESTS													
		TONE ISLANDS Right			HEARING RANGE Right			HEARING RANGE Left			TONE ISLANDS Left				
Date															
VI Oct	E				3			3				E			
	D				6			6				D			
	C				9			9				C			
	B				12			12				B			
	A				18			18				A			
	G				24			24				G			
V Oct	F				36			36				F			
	E				3			3				E			
	D				6			6				D			
	C				9			9				C			
	B				12			12				B			
	A				18			18				A			
IV Oct	G				24			24				G			
	F				36			36				F			
	E				3			3				E			
	D				6			6				D			
	C				9			9				C			
	B				12			12				B			
III Oct	A				18			18				A			
	G				24			24				G			
	F				36			36				F			
	E				3			3				E			
	D				6			6				D			
	C				9			9				C			
II Oct	B				12			12				B			
	A				18			18				A			
	G				24			24				G			
	F				36			36				F			
	E				3			3				E			
	D				6			6				D			
I Oct	C				9			9				C			
	B				12			12				B			
	A				18			18				A			
	G				24			24				G			
	F				36			36				F			
	E				3			3				E			
	D				6			6				D			
	C				9			9				C			
	B				12			12				B			
	A				18			18				A			
	G				24			24				G			
	F				36			36				F			

Perception of Voice.**VOWEL WORK**

RIGHT EAR		LEFT EAR	
First Step:		First Step:	
Began,	Completed	Began,	Completed
Second Step:		Second Step:	
Began,	Completed	Began,	Completed
Third Step:		Third Step:	
Began,	Completed	Began,	Completed
Fourth Step:		Fourth Step:	
Began,	Completed	Began,	Completed

PITCH WORK

RIGHT EAR	LEFT EAR
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CONSONANT DRILLS**SYLLABLE DRILLS**

RIGHT EAR		LEFT EAR	
First Step:		First Step:	
Began,	Completed	Began,	Completed
Second Step:		Second Step:	
Began,	Completed	Began,	Completed
Third Step:		Third Step:	
Began,	Completed	Began,	Completed
Fourth Step:		Fourth Step:	
Began,	Completed	Began,	Completed

Tuning Fork Tests.

TESTS FOR RESIDUAL HEARING.

Name J. X. (boy.)

Address London

Age 10.

Former School

No. months in school 36

Grade

Child's Developmental History:

1. Birth Conditions.

2. Congenital or acquired deafness. *Hearing lost at 3 yrs.*

Cause unknown

3. Early History.

4. Health. *Good*

5. Memory. *Good*

6 Concentration. *Good*

7. Class Work. *Excellent*

[illegible]

Remarks: Test III-18. Responded to each tone after five or six stimulations.
Test of II-19. Responded to tones on first stimulation.
Test of II-20. Responded quickly and said he heard tones very well.
Test of II-20. Quick response. Note depression in distance.
Tests of II-19 and II-20. Had about 2 months stimulation between these dates.
II-21. Can differentiate change of pitch with interval of octave.

TESTS FOR RESIDUAL HEARING.

Name H. Y. (girl)
 Former School State School
 Child's Developmental History:

Address Muscon Age 14
 No. months in school 77 Grade V

1. Birth Conditions.

2. Congenital or acquired deafness.

Acquired. Scarlet fever
when 2 yrs. old.

3. Early History.

4. Health.

Fair

5. Memory.

Good

6. Concentration.

Good

7. Class Work.

Excellent

HARMONIUM TESTS									
TONE ISLANDS Right		HEARING RANGE Right			HEARING RANGE Left			TONE ISLANDS Left	
Date									
VI Oct	B		2			31		E	
	D		6			6		D	
	C		9			9		C	
	B		12			12		B	
	A		18			18		A	
V Oct	G		24			24		G	
	F		36			36		F	
	E		3			3		E	
	D		6			6		D	
	C		9			9		C	
IV Oct	B		12			12		B	
	A		18			18		A	
	G		24			24		G	
	F		36			36		F	
	E		3			3		E	
III Oct	D		6			6		D	
	C		9			9		C	
	B		12			12		B	
	A		18			18		A	
	G		24			24		G	
II Oct	F		36			36		F	
	E		3			3		E	
	D		6			6		D	
	C		9			9		C	
	B		12			12		B	
I Oct	A		18			18		A	
	G		24			24		G	
	F		36			36		F	
	E		3			3		E	
	D		6			6		D	

Remarks: When this pupal entered C. I. S. 3 yrs. ago, she heard all tones of H. Harmonium in R. ear at distances fr. 18" to 36". She heard all patches of Vowel Sept. 1914, but could not interpret language. Vowel & syllable drill improved this quickly. In June 1915 she could talk short stories through R. ear. Development of L. ear has been slow. It requires from 18" to 36" to complete the four steps of vowel drills. Has not yet accurate perception for consonants in left ear.

TESTS FOR RESIDUAL HEARING.

Name *J. K. (give)*
 Former School
 Child's Developmental History.

Address *Missouri* Age *12*
 No. months in school Grade

1. Birth Conditions.

2. Congenital or acquired deafness.

Congenital

3. Early History.

4. Health. *Fair.*

5. Memory

Good

6. Concentration.

Good.

7. Class Work.

Good

HARMONIUM TESTS																			
		TUNE ISLANDS Right				HEARING RANGE Right				HEARING RANGE Left				TUNE ISLANDS Left					
Date		E D C B A G F 3 6 9 12 18 24 36				3 6 9 12 18 24 36				3 6 9 12 18 24 36				E D C B A G F 3 6 9 12 18 24 36					
VI Oct.	E					3					3					E			
	D					6					6					D			
	C					9					9					C			
	B					12					12					B			
	A					18					18					A			
	G					24					24					G			
	F					36					36					F			
V Oct.	E					3					3					E			
	D					6					6					D			
	C					9					9					C			
	B					12					12					B			
	A					18					18					A			
	G					24					24					G			
	F					36					36					F			
IV Oct.	E					3					3					E			
	D					6					6					D			
	C					9					9					C			
	B					12					12					B			
	A					18					18					A			
	G					24					24					G			
	F					36					36					F			
III Oct.	E					3					3					E			
	D					6					6					D			
	C					9					9					C			
	B					12					12					B			
	A					18					18					A			
	G					24					24					G			
	F					36					36					F			
II Oct.	E					3					3					E			
	D					6					6					D			
	C					9					9					C			
	B					12					12					B			
	A					18					18					A			
	G					24					24					G			
	F					36					36					F			
I Oct.	E					3					3					E			
	D					6					6					D			
	C					9					9					C			
	B					12					12					B			
	A					18					18					A			
	G					24					24					G			
	F					36					36					F			

Remarks: When tested IX 1916 shows no perception of sound.
 X-1918 - Fair sound perception. Shows slow but
 continued increase in perception until VI-1919, when
 a marked depreciation in distance was noted in R. ear
 and loss for several tones in L. ear, fairly definite then
 has never responded to voice

TESTS FOR RESIDUAL HEARING.

Name H. X. (boy)

Address St. Louis County Age 10 yrs

Former School

No. months in school

Grade

Child's Developmental History:

1. Birth Conditions.
2. Congenital or acquired deafness. *Acquired deafness - 2 yrs. old, failed conclusions*
3. Early History. *No previous schooling*
4. Health. *Fair*
5. Concentration. *Good*
6. Memory. *Good*
7. Class Work. *Good*

	TONE ISLANDS Right	HEARING RANGE Right		HEARING RANGE Left	TONE ISLANDS Left
Date	♩ ♪ ♫ ♬ ♧ ♨	♩ ♪ ♫ ♬ ♧ ♨		♩ ♪ ♫ ♬ ♧ ♨	♩ ♪ ♫ ♬ ♧ ♨
VI Oct.	E	3		3	F
	D	6		6	D
	C	9		9	C
	B	12		12	B
	A	18		18	A
	G	24		24	G
V Oct.	F	30		30	F
	E	3		3	E
	D	6	—	6	D
	C	9		9	C
	B	12		12	B
	A	18		18	A
IV Oct.	G	24		24	G
	F	30		30	F
	E	3	/	3	E
	D	6	/	6	D
	C	9	/	9	C
	B	12	/	12	B
III Oct.	A	18	/	18	A
	G	24	/	24	G
	F	30	/	30	F
	E	3	/	3	E
	D	6	/	6	D
	C	9	/	9	C
II Oct.	B	12	/	12	B
	A	18	/	18	A
	G	24	/	24	G
	F	30	/	30	F
	E	3	/	3	E
	D	6	/	6	D
I Oct.	C	9	/	9	C
	B	12	/	12	B
	A	18	/	18	A
	G	24	/	24	G
	F	30	/	30	F
	E	3	/	3	E

Remarks: When tested Sept 1948 shows slight perception for voice of low volume. Development of accurate interpretation for voice in R. ear slow.

Has not yet completed 3rd steps vowel drill. Has words within his speech vocabulary, also short phrases in L. ear. Has just completed 1st step syllable drill in L. ear. Synthetic language drill given with syllable drill.

CLASSIFICATION OF DEGREE OF DEAFNESS.

When tests are first made, the classification of the child's degree of deafness will almost always fall into one of the following groups:

Group 1. NO SOUND IMPRESSION WHATEVER FOR ANY NOTE IN THE ENTIRE RANGE.

In this class we would expect to find pupils who give a history of distinct congenital deafness, perhaps a record of heredity or consanguinity in marriage; often two or more deaf children in the family. This first test with the harmonium would also be logically conclusive where negative reaction to tests of the static labyrinth was found and where all functional tests of hearing indicated no sound perception. Profound or total deafness.

Group 2. AN INDIFFERENT OR CONFUSED SOUND IMPRESSION FOR ONE OR MORE NOTES IN SOME PART OF THE SCALE.

Somewhere in the range the pupil responds to one, two or three notes. These notes are frequently within the limitations of C to C¹. They are heard indifferently or indistinctly and no ability to differentiate these sounds is apparent. This group may be occasionally traced to that class of pupils who have sustained some serious constitutional, febrile, toxic attack, in early infancy, such as meningitis, influenza, convulsions, etc. We might assume that such a meagre perception of sound is associated with a degeneration of the auditory nerve, either centrally or peripherally. Somewhere in this tract a few nerve fibers and cells may have escaped the ravages of such toxemia or degeneration and may still respond weakly to an intense sound stimulation.

Group 3. A FAIR SOUND IMPRESSION WITH SOME ABILITY TO DIFFERENTIATE PITCH OF A SMALL NUMBER OF TONES.

We are now approaching the otologic classification made by Bezold of tone-islands. These tone islands are found in the defective labyrinth varying in degree and in position. Bezold subdivides tone islands into five groups when testing deaf mutes. Group 1. A tone-island in which the hearing range does not exceed two and one-half octaves. Group 2. Where there are several tone perceptions at intervals in the musical scale. Group 3. A loss of hearing for the entire upper scale limit and fair hearing for the lower scale. Group 4. Defects of varying degree in the appreciation of sound impressions of tone vibration in the lower scale.

When the perception for this small group of sounds does not extend over a range of one octave, we are still confronted with a pro-

found type of deafness. We have, however, a tangible starting point for our further acoustic practice. The differentiation of pitch of the tones perceived by the pupil may by repeated practice be greatly accentuated and the perception of tone range surprisingly extended. Here we often find the cases of pupils who have been originally endowed with normal hearing and who, at an early age, have become deaf through profound attacks of scarlet fever, measles, smallpox, diphtheria, meningitis, etc. The fact that such pupils show a tendency to respond to graduated acoustic stimulation would seem to prove that the toxic degeneration or pathological changes that have been sustained by the auditory nerve apparatus, either centrally or peripherally, may still be subject to reconstruction, re-education or regeneration.

Group 4. FAIR SOUND IMPRESSION AND FAIR ABILITY TO DIFFERENTIATE TONES IN SEVERAL SECTIONS OF THE WHOLE RANGE.

Here we find multiple tone islands or multiple areas in the cochlear scale that still respond to fairly normal sound impressions. Pathologically considered, the destructive or degenerative changes which have taken place in such an auditory end-organ must have been of an irregularly localized character whereby some of the nerve structures of the cochlear scale have been left unscathed at intervals and the rest invaded. For, in using the notes of the harmonium in such a case, it will be found that the pupil responds to a group of sounds of a tone island in the bass cleff, fails to perceive the tones of an octave or more in the middle register and then perceives a group of tones in the C^1 or C^2 octave. In this group progress by both active and passive impressions of the applied acoustic method is often surprisingly rapid.

Another observation which I desire to make at this point is: Where tone islands can be definitely demonstrated by tests with the harmonium or the continuous tuning fork series, we are justified in the conclusion that the pathology in such cases is in the peripheral acoustic apparatus and not in the auditory nerve centrum, for if the theory of Helmholtz remains unshaken and if the organ of Corti is the selective peripheral acoustic apparatus by which individual musical tones are analyzed, the perception of tone islands and the gaps of deafness in such a given case indicate that some of the arches of Corti with their associated ganglionic cells and hairs of Hensen still function normally, and other groups of such cells and hairs have been destroyed. In such cases, however, it would seem that the auditory nerve centrum must be active in function.

Group 5. PARTIAL PITCH PERCEPTION FOR NOTES IN SEVERAL AREAS OF THE RANGE.

In this class we would include the group heretofore designated as the semi-deaf. Many of these cases may not even prove to have an auditory nerve pathology, but may have sustained some serious impairment to the sound-conducting apparatus—destruction of the drum membrane or ossicles, operative inroads following mastoid or tympanic cavity disease, etc.

ACTIVE ACOUSTIC EDUCATION.

Active Acoustic Education is divided into two processes: Analytic and Synthetic Acoustic Exercises. Through Analytic Exercises we develop the ability to interpret vowels, consonants and syllables as actual auditory impressions independent of the association of ideas and word imagery. The auditory comprehension of language is developed through Synthetic Acoustic Exercises.

It is supposed, when practice with the human voice is begun, that the deaf child has received sufficient instrumental stimulation to develop perception for tones within the range of the human voice, or is physiologically capable of hearing the human voice when Active Acoustic Education is begun.

The fundamental drills, as outlined in the charts, are given each child regardless of degree of auditory residuum. This drill work is as essential for the accurate development of the so-called semi-deaf child as for the extremely deaf child.

PURPOSE OF ANALYTICAL EXERCISES.

1. To obtain, through the use of singly sustained vowels produced on various pitches, a prolonged auditory excitation which will form the connecting link between instrumental stimulation, in the case of the extremely deaf child, and will afford a means of giving sufficient drill on interpretation of vowels given on various pitches, in the case of the semi-deaf child.
2. To develop accurate auditory impressions of vowels and consonants when heard in any combination.
3. To develop definite auditory impressions independent of word imagery, and the association of ideas, two factors which tend to make the interpretation of Synthetic Acoustic Exercises more simple than the Analytic.

METHOD OF PROCEDURE.

The same procedure is followed in each of the four vowel steps.

1. Taken singly and in groups, the vowels

o-e, ee, a(r), oo, and aw

are first taught with a singing, sustained tone, as the sound vibration so produced makes possible a more definite stimulation than the spoken tone, and we strive for the greatest amount of continued stimulation at this stage. When the child can interpret these vowels without error, the duration of tone is gradually shortened to that of the normal vowel as used in connected language.

2. The diphthongs oi, ow, i-e, a-e, u-e are given singly and in combination with the normal speech duration, and the volume of voice regulated according to the need of the individual child.

3. It is sometimes difficult to teach the child to respond only to tone impressions, and not to the tactile impression. In order to overcome this difficulty the vowel o-e is called directly into the ear and the child allowed to feel the breath impulse. Next o-e is produced without voice, the teacher being especially careful to give the same amount of breath impulse with non-vocalized vowel as with the vocalized. The child feels breath impulse of non-vocalized vowel and is taught to tell when vowel is produced with voice and when without. It is in this way that the child is taught to listen for, and respond to, tone impressions.

4. From now on we try to prevent the child from receiving impressions tactilely. In order to do this the teacher must not allow the child's body to touch her, must not place her own hand on the child, and must either hold a piece of cardboard between her mouth and the child's ear, or speak through a simple megaphone.

5. Two important points:

- A. To teach the child to interpret the same vowel on different pitches.
- B. To so give these drills that the teacher may be sure the child is interpreting the vowel as to its individual intensity, tone and color, and not as to any particular pitch on which the teacher may produce individual vowels.

6. The teacher should adopt the lowest note on which she can produce a good resonant tone, as her tonic. She begins by

producing **o-e** on this pitch. After the child positively responds to the vowel upon this pitch the teacher immediately begins to develop a perception for changed pitch by producing **o-e** on the octave of her tonic tone. Next she gives the vowel alternately on low and high pitch, thus giving the child the opportunity to compare **o-e** produced on the two pitches. In the same manner the intervals of the fifth and third are developed. A relative repetition of pitches produced by the teacher is required of the child, and can be obtained from all but the extremely deaf. We do not wait, however, to secure this relative return of pitch before taking up the second vowel. We take up the second vowel as soon as the child can interpret without hesitation the vowel **o-e**.

7. **Ee** is the second vowel compared with **o-e**. There is the greatest difference in intensity and tone color of these two vowels, hence it is easier for the child to interpret and compare **o-e** with **ee** than with any other vowel. **O-e** will be produced on the tonic tone the teacher has adopted, and then **ee** on the same pitch. Sufficient practice is given for the child to be able to differentiate between the two vowels. The next drill is given for comparison of **o-e** and **ee** on the different pitches as described in (6).

8. Other vowels listed in First Step of the chart are taken up one by one and compared with each vowel the child already knows. As stated in (1) only **o-e**, **ee**, **a(r)**, **oo**, and **aw** are used on different pitches.

9. When the pupil can interpret the single vowels they are combined into groups of two, three and four. The same procedure is followed as with the single vowels, that is, they are taught on the same pitch and then on different pitches. We begin work for accent in the vowel drills.

10. When teaching the Third and Fourth Steps of vowel drill do not stop and repeat one or two vowels if the pupil fails to repeat accurately. We are trying to train the visual memory as well as the auditory center and must keep constantly in mind the fact that each vowel or group of vowels has a decided tone coloring of its own. When we give **o-e**, **ee**, **a(r)**, **oo**, and **aw** and the pupil fails to repeat all vowels correctly, we do not change the combination or simply repeat one or two of the vowels. If we do this we change the whole tone picture and do not teach the pupil the original group of vowels. Give an

entirely new group if necessary to secure renewed attention, but go back continually to first group until the child can repeat.

11. Syllable Drills. In the syllable drills each consonant is taken up in turn with the different vowels. In the First Step of Syllable Drills the consonant is placed between two vowels, as consonants between vowels are more easily heard than at the beginning or end of a word. These drills are given in groups of three, to prolong the auditory excitation, to give the pupil the advantage of receiving the one auditory impression more than once before being asked to interpret, to develop continuity of speech, and to be used as drills for changed inflection and accent.

SYNTHETIC ACOUSTIC EXERCISES.

Synthetic Acoustic Exercises will be planned to meet the needs of the individual child. The following are three entirely different types to be considered:

Type One. The child whose dormant auditory center has been awakened through instrumental stimulation to the extent of making it possible for him to interpret analytic acoustic exercises. He has completed analytic drills. We now begin synthetic acoustic exercises. Series of words of one syllable classified as to their audibility, that is to say their pitch or sonorous characteristics, are first taught; next, series of more than one syllable, syllables being of unequal pitch, are given; then a series containing the same consonants but different vowels. After a comprehensive drill on individual words is completed, we begin work on phrases and sentences. The ear can perceive only five syllables per second. It is therefore necessary to augment the intensity and duration of articulated sounds in presenting synthetic exercises as well as analytic. The one phrase should be given by the teacher and reproduced by the child in a voice modulated to different degrees of intensity; syllables should be prolonged and then with practice gradually shortened to the normal duration. The same phrase or sentence is taught with the different rhythms, accents and tempos. Every means to produce greater excitation should be employed.

Type Two. The child who has been in school several years, has quite an understanding of language and is physiologically capable of hearing such language, but who can interpret nothing through his hearing. We would immediately begin active acoustic education with this child in order to develop an appreciation for all articulate sounds and at the same time would try to establish a co-relation between the auditory and language centers by synthetic exercises, following a definite language plan.

Type Three. The very young deaf child who upon entering school shows a marked residuum of hearing. Synthetic acoustic exercises based upon lip-reading vocabulary would be taught and the child's auditory appreciation of language developed just as his visual appreciation is developed through lip-reading. Analytic exercises would be given the child of this type as soon as his speech mechanism permits.

OBSERVATIONS AND DEDUCTIONS.

Persistency in Application of Acoustic Exercises.

We have frequently observed the perception of a harmonium tone, of a sustained vocal sound or of a word only after daily and painstaking repetition of the same exercise, continued for weeks and sometimes months. However, when such sound impression is once heard by the pupil, successive exercises progress with less difficulty. Even when the stage of word-hearing has been reached, it may require numerous repetitions before the pupil makes accurate response and before the word-image is definitely impressed.

Awakening of the First Sound-Perception.

The awakening of the pupil to the first sound-impression is usually sluggish, be the sound that of a musical instrument or of the voice. The sound is an unfamiliar thing, the physiological stimulation is a weak one, the mental impression has not yet been registered. We experience the same reaction in lesser degree in normal hearing. A sound which is unfamiliar to our ear, of slight volume and unknown mental registration, must be repeated to a normal ear before it acquires an accurate interpretation.

Sound Comparisons.

Many of our educational impressions by all of the senses are the result of comparisons. We are taught color, form, size, by comparison; we appreciate heat or cold, rough or smooth, light or heavy, by comparison. We hear loud or soft, high or low, by comparison. So, too, we develop the acoustic method by comparison. We have elicited our first sound impression, whether by harmonium or voice. It may be the harmonium tone C, or it may be the sustained vowel A. To the pupil this is frequently but a sound impression without definite character. We now introduce our comparative element; let it be the harmonium tone G or the sustained vowel O. Sometimes this second step will produce an immediate comparative impression to the pupil. Or, the pupil will be unable to distinguish between the second sound and the first. To him it

may be simply a sound impression without intensity, without pitch, without timbre, without direction. The dormant auditory mechanism must of necessity be slow of stimulation or of development. Many of the delicate histological structures in the organ of Corti may have become so inert from disuse that little or no impression can be made and such minute stimulation must be repeated again and again before a sufficiently tangible stimulation and re-education has been established to yield a practical auditory result. Comparative sounds conveyed to the ear seem a logical form of stimulation, for we thereby educate both passive and active impressions by the same effort. The repetition of the same musical sound-wave produces a mechanical and physiological stimulation in the cochlear end-organ; comparative musical sounds awaken a mental differentiation in the brain as well as a physiological selective differentiation in the organ of Corti.

Word-hearing and Word-imagery.

It is one thing to establish word-hearing; it is quite another thing to develop word-imagery. One is physiological; the other is psychological. Word-hearing depends on the accuracy with which the selective end-organ in the cochlea responds to sound combinations; word-imagery is developed only when word-hearing has been associated mentally with the object or thing to which such word applies.

It is good practice, as shown in the exercise tables, to group a series of words of similar sounds: bowl, pole, mole, coal. Association of ideas is as important in this practice as it is in the development of lip-reading. To the hard of hearing pupil a lip-reading exercise containing words of similar combinations and of similar spoken form is understood more accurately when the meaning of the word is fitted to the phrase in which it occurs. A word spoken independently is more difficult to comprehend even by a normal ear than a word that is part of a phrase.

Another point not to be overlooked is the scholarship of the pupil. It is difficult for a pupil with defective hearing to comprehend a spoken word, the meaning of which is unknown. Normally, it is even difficult for the healthy ear to hear words in quick succession where the sentence is meaningless. For instance, if an abnormal-hearing person is addressed in a foreign language, the words are unintelligible, not because they fail to register in the ear, but because they fail of comprehension in the brain.

As the faculty of association of ideas develops by practice, the hearing takes on more rapid response. Word-hearing and word-

imagery succeed each other automatically in normal cerebation and in our acoustic practice we strive for such normal association of word and idea. The more we develop this association of ideas the quicker is the response to word hearing.

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THE EFFECT OF METHODIC ACOUSTIC EXERCISES ON THE HEARING ORGAN OF DEAF-MUTES.

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In 1894, I presented to the Naturforscherversammlung in Vienna a group of deaf pupils from the Doebling Institute for the Deaf. These pupils had been trained by acoustic exercises and with excellent results under the supervision of Direktor Lehfelt.

As a result of this demonstration, similar acoustic exercises were introduced in various places. In Germany, Bezold particularly, and also Passow and others applied these exercises successfully. Thanks to these men, residual hearing has been conserved and developed. Lack of opportunity limited the application of this method to pupils in whom considerable residual hearing was evident.

As the results in individual pupils became evident, Direktor Brunner of the Israelitic Deaf Institute in Vienna used the exercises with a much larger number of pupils, and after several weeks' observation, continued only with those having the greatest residuum of hearing.

A careful examination of large numbers of deaf-mutes demonstrated a surprisingly high percentage of considerable residual hearing, even among those considered totally deaf. This may be partly ascribed to the confusion or inability to hear and inability to comprehend the spoken language.

A deaf boy was presented to me and his teacher announced that he could hear nothing other than his given name. As various words were spoken to this boy, he gave no response, but when his name, "Frank," was called, he turned to the speaker. I explained to the teacher that it was impossible for this boy to hear only his name and to be deaf to all other spoken stimuli, but that this must be ascribed to the fact that the name "Frank" was the only word that he understood. I tested him with a series of words and found that in a short time he heard and repeated a group whose meaning he understood.

In another case the hearing for the vowels a—e—i—o—u, when first spoken, made an indefinite impression and after some practice, the differentiation of the several vowels was clearly appreciated. I cannot emphasize too forcibly the great significance of the difference between an inability to hear and an inability to comprehend what is heard.

We begin our exercises with individual vowels, calling them into the ear with sustained voice, preferably using *a* and *o* for first dif-

ferentiation and indicating to the person which vowel is being called. When both vowels are heard, the pupil must state the order in which he hears them. The other vowels are gradually included in this practice.

To make these exercises more stimulating, words easily understood, as *mam-ma*, *pa-pa*, *Au-ge*, *Na-se*, are spoken in slow, prolonged voice. The pupil is told in advance which word will be used, as the first use of a word, even when the individual letters are heard, is not understood. Words must be acoustically memorized, as in learning a foreign language. The pupil must repeat the practice-word in each instance, as only in this way can wrong hearing-impressions be corrected. Short sentences are also adaptable to these exercises, and these the pupil gradually acquires. These exercises stimulate and may be used at a time when individual vowels are not yet clearly differentiated. We must not neglect to compare the wrong with the correct hearing-impression of words with similar sounds, as *coal*, *bowl*, *mole*, repeating them continuously until the pupil differentiates correctly. The same practice must be observed to overcome the confusion in single consonants. Words without meaning are used; the pupil must repeat these accurately to indicate his concentrated attention. This may also be done with short sentences. The pupil at first should be trained by the same voice, until a stage of hearing is acquired when different voices should be used. The pupil may practice by himself with musical tones or his own voice. For practice with musical tones an harmonica is especially adaptable; later the piano, wind and string instruments may be used. A conversation-tube may be used by the pupil and elements and words spoken into the funnel-end with enough voice to stimulate hearing-perception. Those who can hear without the use of the hearing-tube, should not employ it.

Practice with musical tones to acquire pitch and to recognize melody are very necessary for hearing perception. The hearing-perception in deaf-mutes is subject to much fluctuation, especially noticeable when the exercises are first instituted, and all acquired results may seem to have disappeared. We must not be discouraged by such conditions, as these are transitory and will be re-established by further exercises. Acoustic-fag may occur in the early periods of practice; this must not be ignored, as nervous conditions, especially headache, may result. Continued and concentrated attention for a deaf pupil is very fatiguing, therefore acoustic exercises should be undertaken several times daily in 5 to 10 minute periods. The pupil's inclination to these acoustic exercises is at first negli-

ble, but gradually develops. As a rule, they take kindly to them, and the hope of hearing creates a psychological stimulus. To a pupil who has never heard the acquisition of even vowel perception is of great value, as vowel-hearing modifies the unpleasant, unmodulated voice of the deaf-mute. Every vestige of hearing acquired by the deaf pupil is of great practical value, both for his physical welfare and for utilitarian ends.

Pupils who have successfully acquired language perception may more readily find employment as evidenced by many examples that have come to my attention. A wide field of usefulness lies before the instructor whose self-sacrifice and patience will bring returns of great joy and satisfaction.

RECENT PROGRESS IN THE SURGERY OF THE ACCESSORY SINUSES.

PROF. E. J. MOURE, Bordeaux, France.

We are inclined to think that the surgical treatment of suppurations of the accessory cavities of the nose is of recent date. Nevertheless, in maxillary sinusitis particularly we recall that early in the nineteenth century the French surgeon, Desault, opened the antrum through the canine route to curette and to drain it through this artificial opening. This author also advised daily gauze packing until the operated cavity was smoothly healed and only a slight cupiliform depression at the gingival margin remained. This method of treatment is still used by some surgeons today who ignore the progress made in the surgical disposition of maxillary sinusitis and who persist in using this obsolete and prolonged treatment. The treatment of frontal sinusitis has also been the subject of study and the surgery of this region has undergone various important modifications. Twenty years ago Panas conceived a special probe

to enlarge the naso-frontal duct after having opened and curetted this cavity through the external route. This author also treated suppurations of this region as Desault had done for maxillary sinusitis by packing the sinus from without inward with antiseptic gauze. These somewhat antiquated methods are today almost abandoned and we will now review successively the different procedures of surgical treatment applied to each of the accessory cavities of the nasal fossae and the progress that has been made in curing these chronic suppurations.

I. *Maxillary Sinus.*

The maxillary sinuses remained for many years in the hands of the dentists who alone knew them and treated them, but finally they attracted the attention of the oto-rhino-laryngologist. At first this group limited themselves to the treatment devised by Megitot and various other stomatologists; that is, the opening of the antrum by the buccal route after removing the tooth (preferably the first molar). Into this was placed a rubber drain, an ebony plug or a silver tube supplied with a flange which prevented it from penetrating into the antrum of Highmore. Sometimes this tube was itself surmounted by an artificial tooth held in place by fastening it to the neighboring tooth. The patient was obliged morning and evening, or at least once in twenty-four hours, to remove the ebony plug or the tooth and its tube and to syringe through this artificial opening to clean this cavity of pus, but this was inconvenient because of the communication into the mouth. Besides allowing the buccal secretions to carry septic particles into the affected region, liquid food often penetrated the antrum, occasioning or keeping up the infection of which it was the site. In some cases the head of the plug or flange of the silver tube penetrated into the sinus and constituted a foreign body, which it was then necessary to remove by the canine route. Other authors make a diminutive hole in the gingivo-labial fold at the level of the canine fossa. Through this orifice the patient flushes the cavity. An ebony plug keeps open the passage and prevents to a certain degree food and particularly liquids from passing into the affected cavity. The bony perforation and the mucosa sometimes produce a fistula and the daily flushing can be undertaken through that route, thereby making the plug or tube unnecessary. These treatments through the alveolar route are almost entirely abandoned today or are only applied when it is impossible to do otherwise; when the patient is very exhausted or very old, or in cases in which a more important operation is impossible.

In place of the flushing through the alveolar route, flushing through the natural orifice of the sinus was substituted and I recall the time when each of us after cocanization of the osteum maxillaris with the aid of a specially curved canula penetrated into the sinus and flushed it in attempting to cure the suppuration which had its site there. Until the last few years this procedure had its devoted adherents who lauded this method, which was more medical than surgical.

Following this came the flushing or drainage through diameatic puncture. Under local anesthesia with the aid of a small trocar the internasal sinus wall was perforated below the insertion of the inferior turbinate, the needle withdrawn and an antiseptic or aseptic solution injected through the tube in order to learn the contents of the sinus and afterward to disinfect it. This procedure cured a certain number of cases.

Some cases nevertheless did not respond to this therapeutic measure and it was then that Mikulicz Claoué conceived the idea of making an opening in the inferior meatus, after resecting the head of the turbinate, through which the patient was himself able to cleanse the sinus, often by aspirating the liquid or by using a special canula for flushing it. These procedures of making a large sinus opening through the inferior nasal route were numerous and each operator imagined that his more or less perfected instrument allowed the osseous opening to be made at this level. The gouge, the burr and the trephine, as well as the electric drill, were successively developed.

Such procedure was followed by a certain number of cures, but did not suffice in all cases.

Caldwell and Luc almost simultaneously conceived the idea of making an ample opening into the maxillary sinus through the canine fossa to curette it, to sponge it, to disinfect it and to create an opening between the corresponding nasal fossa and the operated cavity. A rubber tube was inserted for drainage and lavage; later the gingival fold was sutured to abolish all communication with the mouth. This method differed essentially from that of Desault.

This operation showed considerable progress and we owe to it most of the definite cures of chronic maxillary sinusitis and it is rightfully called the radical operation or the Caldwell-Luc procedure.

There is but one modification in the early technique: instead of making a narrow opening between the maxillary sinus and the nasal fossa which always has a tendency to retract and even to close,

many surgeons actually remove almost all of the intersinu-nasal wall in order to establish a permanent communication between these two cavities until the sinus begins to fill up, eventually to disappear. Denker devised the method of entering the maxillary sinus through the pyriform opening to assure at the outset a communication between the nasal fossa and the antrum of Highmore. This operation does not seem to have much advantage over the procedure of Caldwell-Luc. It may have its indications but, in my opinion, cannot be exclusively used in all cases.

We also have recourse to a combined procedure which consists, after the canine fossa has been opened, of invading the bony bridge of the superior maxilla from within to reduce the space which separates the antrum from the nasal fossa. By this means we prevent the intersinuso-nasal closure and facilitate drainage of the maxillary cavity. After all, it is necessary to choose the most advantageous procedure in each case; the one that will most promptly and most definitely effect a cure. A careful curettage and removal of all fungus growth and of the mucosa that lines the walls of the sinus are the means of obtaining an occlusion of the latter through a fibrous cicatricial tissue that will permanently prevent recurrent infection.

II. *Fronto-ethmoidal Sinusitis.*

The surgical treatment of fronto-ethmoidal sinusitis has also made considerable progress, but this therapy has undergone some interesting changes. Schoeffer of Bremen extolled the treatment of chronic frontal sinusitis through the natural channel. This physician advised removing the anterior end of the middle turbinate by means of the cutting forceps and following this by use of a special canula having the form of an Eustachian catheter slightly curved in the form of a very elongated S. He catheterized the naso-frontal canal and flushed the sinus through this. This treatment seemed to have given some favorable results. It served to establish the diagnosis of these suppurations, but it also occasioned the death of some patients when the injection was not made in the sinus, but under the meninges through the cribriform plate of the ethmoid. These failures discouraged the specialists somewhat, but with the advent of antiseptics and asepsis the operation through the external route was attempted. The procedure of Luc and Ogsten consisted of opening the frontal sinus on the level of the frontal prominence, removing a sufficient part of the external table to inspect the cavity and above all to permit it to be conveniently curetted. This done, the naso-frontal canal was enlarged from below at the level of the

infundibulum, establishing a large drain of the operated region by this artificial route, which communicated with the corresponding nasal fossa. Petzer's probe passing from the frontal sinus into the nose and emerging through the nasal orifice, permitted the cleaning of the cavity if it was necessary, and, above all, assured drainage. The external wound was then completely sutured. In the hands of a serious and careful operator this method resulted favorably. It was simple, easy of execution, without danger or mutilation. Nevertheless, there were some failures, such as secondary fistulas, orbital abscesses and other complications.

To avoid these unpleasant results, a far more destructive and more mutilating method was introduced and advocated by Kunt, whose names it carries, and this operation consisted of removing the external table of the *frontal* bone in such a manner to lay bare the entire cavity of the corresponding sinus. As in the first case, the naso-frontal canal was enlarged and the skin flap brought in contact with the internal table to avoid, as the author expressed it, all "dead points" at the level of which reinfection occurred. This ideal cannot always be realized because in some cases the sinuses extend above the orbit or to the side of the temporal fossa presenting irregular prolongations which make it impossible to apply the skin flap. To overcome these troublesome factors in the Kunt operation, Killian developed the operation which bears his name. It consists of resecting all of the interior walls of the frontal sinus, always conserving the osseous arch under the eyebrow; however, all of the superior orbital wall in contact with the sinus is removed. Externally the skin of the forehead is applied, and interiorly the orbital tissue fills the opening left by the removal of the bony arch of the orbit.

These two German methods met with much success everywhere. Needless to say they mutilated greatly, and the patients operated by one of these two procedures showed such apparent cicatrices that oftentimes they attempted to hide the disfigurement by a very ingenious hair dress in order to hide the operated region. These large interventions, important and *serious*, because all who applied them have had some unfortunate results, have not given more satisfaction than the really esthetic operation of Ogsten-Luc. In reality it is not the dead points left in the operated frontal cavity that produce reinfection and secondary suppuration, but rather the diverticular cells sometimes forgotten in the depth of the frontal area and more often in the ethmoidal portion of the sinus. We must not forget that the frontal sinus is only an ethmoidal diverticulum as Mouret has de-

scribed, and that it is at the level of this bone that the frontal sinus really begins.

Many experienced operators take the precaution when operating the frontal cavities externally to enlarge their incision from below to be able to clean the anterior ethmoids and to remove all those cells which at this level are the possible source of secondary fistulization.

Others, among whom I class myself, take the precaution to clean the ethmoid by the endo-nasal route under cocaine anesthesia so that when the frontal sinus is opened, curetted and well-mopped within its recesses with a ten percent solution of zinc chloride, the only other procedure is to enlarge the naso-frontal canal at the level of the infundibular region to assure a large drainage of the operated sinus. It is my practice to pack the latter with iodoform gauze, penetrating the corresponding nasal fossa and emerging at the level of the internal angle of the cutaneous incision. I do this because when the dressing is removed by the natural channel, I am assured that all is removed and that no debris remains in the frontal cavity.

Recently a large number of specialists have resorted to the old method that consists of opening and cleaning the frontal cavity by the *natural* route. For this purpose a series of instruments have been invented; rasps to enlarge the naso-frontal canal, probes and curettes to clean and curette it at least at the level of the infundibulum. In cases that we may term superficial or infundibular, this procedure may give satisfactory results, but on the other hand it exposes the patient to a series of accidents which one does not care to encounter. I think it is impossible to cure extensive frontal sinusitis, especially when this cavity is much involved, very irregular and sometimes even filled with fungus growth or pus, by such procedure.

I would not consider it progress to return to the epoch already past and of which I have spoken in this article.

If we recall that to cure a frontal sinusitis and to avoid its recurrence, it is absolutely necessary to eradicate the cavity and that we are unable to attain this result, as I indicated in my communication to the Congress of London ("What Becomes of the Operated Sinus"), without removing all the mucosa which lines the sinus, that is complete curettment in *all* its recesses, we will understand that an operation by the external route *only* can effect a cure. The procedure which I now employ is but a modification of Ogsten-Luc. I limit myself to making a rather large bony opening at the level of the frontal boss in order to inspect the *whole frontal cavity* and to

assure myself that I have curetted it completely; this osseous opening is insufficient, nevertheless, to produce a very apparent mutilation. In case the removal of a part of the external table of the frontal is greater than I anticipated, I close the largest part by means of an osseous flap removed from that part of the frontal bone adjacent to the site of operation. This flap forms a sort of resisting cover adherent to the overlying bone by a sort of periosteal hinge. In this way all external deformity is avoided, especially if the incision of the skin has been made along the line of the eyebrow previously shaved. As above mentioned, I have returned to the use of a modified Ogsten-Luc operation, of which I can speak most favorably.

Local Anesthesia. I do not recall from memory the considerable progress accomplished in the surgery of the accessory sinuses, maxillary, frontal or ethmoidal, since regional and local anesthesia has been substituted for general anesthesia, but these suppurative sinuses should be operated under local anesthesia. Toxic cocain at first employed was later replaced by Novocain and finally by its French successors, Alocain, Scurocain or Synccain. These anesthetics augmented by adrenalin (five drops per 20 cc.) are well-known to all specialists and by their use we obtain total anesthesia in the region to be operated. To complete the anesthesia we swab the tributary mucosa with a fifteen percent solution of cocain (without adrenalin).

III. *Sphenoidal Sinus.*

The surgery of the sphenoidal sinus has not made the same progress as that of the other sinuses. The sphenoidal sinus is less often invaded and the diagnosis of this suppuration is less easily established. The sphenoidal sinus has generally been reached by the endo-nasal route under cocain anesthesia. After removal of the middle turbinate and exposing the perpendicular plate of the ethmoid, flushing of the sinus is easily accomplished by the aid of a catheter pushed straight into the interior. In some cases the orifice of the sphenoidal antrum has been enlarged and even all of the anterior wall of the sinus removed in order to produce better lavage and better drainage. In certain cases where the thickness of the cranial wall at this point is known, we can without danger curette and apply a ten percent solution of zinc chloride to the infected region. This procedure, however, is rather disagreeable to the patient because it is painful. Finally some authors advise approaching the sphenoid sinus through the canine fossa by passing through the maxillary sinus. This operation, somewhat successful, has not found

many adherents. It seems indicated especially in cases of pansinusitis when it is necessary to curette and clean all affected areas. Reaching the sphenoid cavity via the maxillary antrum, however, is too formidable an operation to employ in simple suppuration of the sphenoid cavity.

IV. *Pansinusitis.*

When all the sinuses of the face are affected, happily a rare condition but sometimes very grave, one must consider the necessity of wide exposure in performing the Rouge operation; that is, to lift the cutaneous mask up from below to examine the entire skeleton of the face. In this way the maxillary, sphenoidal and ethmoidal and even frontal sinuses are simultaneously opened so that they may be curetted, cleaned and eventually cured. This operation constitutes an important and sometimes dangerous traumatism, and it is perhaps better to operate upon one side at a time, proceeding by the successive steps as above indicated.

In summing up, we may say that the surgery of the accessory sinuses of the nasal fossae has undergone many changes and after the critical resumé just made we may claim that work on the maxillary sinus has been much improved by the progress of modern science. On the other hand, if the surgery of the frontal sinus has undergone various fluctuations it is evident that the unsuccessful consequences, more or less grave, may be attributed to the operative procedures employed, which are not always exact. We must bear in mind the frequent variations and anomalies in the anatomy of the frontal cavities, the possible existence of diverticuli which escape the operator and that the ethmoid cells themselves are not always easy to disinfect. This will explain the large number of recurrences that have been observed. An involuntary oversight in these remarks need not be taken as a reason to abandon a good method which, in the large majority of cases, would permit us to cure our patients without mutilating them or without external deformity; this is a consideration of highest importance when we perform operations upon the face; in effecting a cure, we must never lose sight of the esthetic form of the face. Be that as it may, we have endeavored to place before the reader in this small compass the interesting question of sinus suppurations, and the different phases of surgical and therapeutic evolution.

REVIEW OF TWENTY-FIVE YEARS' OBSERVATION IN PLASTIC SURGERY, WITH SPECIAL REFERENCE TO RHINO-PLASTY.

DR. JOSEPH C. BECK, Chicago, Illinois.

In accepting the invitation of the editor to present a paper on Plastic Surgery in the Anniversary Number of *THE LARYNGOSCOPE*, I thought the best I could do was to make a clear and concise statement of my observation of results obtained in a fairly large amount of material of the most varied conditions by operators at home and abroad. I shall, however, confine myself as much as possible to the subject of Rhino-plasty.

A paper on Plastic Surgery without illustrations is almost unthinkable, nevertheless, this one shall be such, since the necessary illustrations would take up space that cannot be asked for in such a number as this.*

My own experience began in the practice of my two teachers, two of the cleverest in this line of work in this country at that time. The one was Dr. Nicholas Senn and the other, my brother, Dr. Carl Beck. In receiving personal instructions on their cases, as well as assisting in all the experimental work and in taking care of the after treatment, I gained, I believe, the greatest stimulus in Plastic work. I mention this because I have been frequently asked the question as to how one can become a Plastic Surgeon.

There has been quite an evolution in this type of Surgery about the face in the past twenty-five years, as far as the Oto-laryngologist is concerned. My first presentation in Pittsburgh in the year of 1908, before the A., L., R. & O. Society, was one of the earliest reports and was received, with little or no enthusiasm, and with the exception of Drs. M. A. Goldstein and George Richards, the subject was considered out of the field of the oto-laryngologist. Dr. John A. Roe was practically the only man in that specialty, at least in this country, who attempted heretofore this line of work and his results unfortunately were always published without illustrations of technic, so that no one imitated him in his efforts. The plastic work was principally performed by the general surgeon and

* (Any reader may, by writing to author or the *Laryngoscope*, obtain reprint and illustrated articles, herein reported, which have appeared within period of 25 years in *THE LARYNGOSCOPE*.)

charlatans, and the results were far from satisfactory. The reason the general surgeon, with the exception of Drs. John A. Roberts and V. P. Blair in this country, so often failed was because of the lack of co-ordinating his surgical attainments with the function of the nose. He also very often failed in the true cosmetic effect and frequently a large or Roman nose was made on a small or Prognatheus face or vice versa. The charlatans, most of them being physicians who failed in their regular fields of medicine, had neither the surgical skill, judgment as to whether the case belonged to the neurotic person, nor cosmetic acumen, therefore absolutely failed, and oftentimes with seriously deforming consequences to the patient.

When in 1910, Gersney published his work on the use of paraffin, charlatans received a new impetus, for now it was easy and without any requirement of surgical skill. At about the same time the oto-laryngologist began to employ paraffine for nasal deformities and for about ten years I employed it in a fair number of minor nasal depressions in which I had very good results, and no untoward effects. With the report of the first serious complication following its use, especially for filling out larger depressions or saddle noses, the oto-laryngologists, as Harmon Smith, Dowling and myself stopped employing paraffin for these purposes, but the charlatan still continued to use it. One of the most distressing complications, although not so serious as some other, is the paraffinoma, and I have had three cases, two of which followed paraffin injection by charlatans (2) and one (1) in my own practice, although not from its use for cosmetic reasons. It developed ten years after injecting paraffin into the lateral inferior wall of the nose for the purpose of narrowing the intra-nasal space in a case of atrophic rhinitis.

Although Mikulicz and no doubt others before him had employed rib and other homo-substances for transplants into the nose, it remained for Max Joseph of Berlin, to popularize the method especially from the intranasal route. At the same meeting at which the writer first presented his results on rhino-plastics, Dr. W. Carter demonstrated his method of correcting a saddle nose by means of operation, elevation and retention by means of his clamp. He also demonstrated a method of rib transplantation into a saddle nose using an external route. Both of these measures have been relegated for better intranasal methods. Dr. Lee Cohen is deserving of a great deal of credit for his work on this intranasal method and demonstrated some excellent results.

As to the correction of the humped noses, markedly twisted, long and pendulous tips of noses with extremely large nostrils, it again remained for Max Joseph to set the pace, especially since his results were obtained by intranasal methods. It was comparatively easy to follow Joseph's technic from his very well illustrated articles and the writer's results were all that one could expect in the few cases wherein he found a clear indication for performing such operation. Some of the oto-laryngologists in this country who began to employ rib or tibia transplants for saddle or sunken nose, as well as attempting to reshape humped, twisted or crooked noses, also reshaping of the tip or alae, were Carter, Metzenbaum, Selfridge, Graham, Lee Cohen, Ira Frank and others, as S. I. Iglauer, who did considerable work of this type without much publication. Gordon B. New of Rochester, published his experience with the use of celluloid implants for the correction of saddle noses and claimed good results with this method. I have had no personal experience with celluloid implants, having rejected them on the ground that they were foreign bodies and would not be assimilated as well as the bone or cartilage graft, nor even as well as the paraffin. Aside from this, I had had my experience and failures in my work with Dr. Senn and Dr. Carl Beck, who had employed other foreign substances as gold, silver and aluminum. These substances healed in very well, but were sooner or later extruded, inasmuch as a foreign body is not well borne by the tissues about the nose.

Between my first publication mentioned above and the contribution of the chapter on Plastic Surgery in Loeb's Text-book, Vol. 1, in 1914, I presented a number of Plastic and reconstructed cases (between 200 and 300) before the Chicago Otological and Laryngological Society, which appeared from time to time in the Transactions of that society in *THE LARYNGOSCOPE* and *Annals of Otology, Rhinology and Laryngology*. In these contributions there always were many more cases of actual reconstruction, either of total or partial loss of the external nose, than of the so-called cosmetic cases. I have refused to operate many more cases of this latter type than I have accepted, because I have always felt that in most instances the correction was unnecessary and only giving in to a neurotic or self-centered, vain individual. Beside, they give one a great deal of trouble in never being satisfied. It must be admitted that this refusal has been a losing proposition from the pecuniary point of view, because most of these patients are more than willing to pay and pay well for that sort of work. Shortly after the great world war began, there was created a great enthusiasm for Plastic

Surgery and the literature began to teem with case reports from Germany, Austria, Italy, England and France. In this country, too, could be seen a sort of "get ready" disposition and to that point I contributed a number of articles, including a Text Book on Plastic Operations on Nose, Throat and Ears as Demonstrated on Cadaver and illustrated by stereoscopic photographs. This work also included the clinical publication of many of my cases. Dr. Ira Frank kindly collaborated with me in this work. When war was declared by the United States on Germany, it became my great pleasure and privilege to be commissioned to instruct a number of American surgeons and dentists who were commissioned in the Plastic Division of Head Surgery.

In 1918, I went overseas and during the ten and one-half months' stay it was my privilege to do considerable work in the immediate reconstruction plastic operations about the face, jaws, etc. The result of this work I presented before the American Academy of Ophthalmology and Oto-Laryngology and published in *THE LARYNGOSCOPE* in 1920. In this article I also presented the plastic surgery of the nose, throat and ear as met in civil life, special reference being given to the cosmetic side of the question. If space permitted, I could do no better than to reiterate considerable of what I said there and would refer the reader to the article. Suffice it to say here, that I deplored the cosmetic results on most of the reconstructed cases of those upon whom I operated, as well as those I had seen in the various important centers of Plastic surgery. I had made it a point to visit many of these places and some of them are worthy of special mention. These include the many hospitals in Paris, London, Sidney, Lyons, Vichy, Rome, Bologna and Prague abroad, and at Jefferson Barracks, Ft. McHenry and Walter Reed in the United States. Upon my return to this country into civil practice I accepted a position with the United States Public Health Service and have been ever since doing the plastic surgery and re-operations on men assigned to Chicago. This has given me the additional opportunity of seeing and judging the type of work which had been done by many men overseas, as well as in this country before the soldiers were transferred to the United States Public Health Service. I must state that in the majority of cases, there were evidences of complete ignorance of the fundamental principles underlying plastic surgery.

In conclusion, I wish to mention some of the men in this country and Canada who have devoted considerable time and effort to plastic and reconstructive surgery during the war, and since, making it

possible in the future to develop this work to the dignity to which it belongs. They are: Drs. Villray Blair, Shafer, Ivy, Smith, Arbuckle, Coughlin, Waldron and Ridsen. Undoubtedly there are many more, but it is with the work of the above-mentioned that I am acquainted. The roster would, however, not be complete without mentioning the work of Le Maitre and Sibilo of France, Gillis and Cole of England, and Alexandro of Italy, whose work I had the pleasure of witnessing, also the remarkable results they obtained. Of particular value is the mentioning of the association of the dental or mechanical division during the war, which is being very much neglected in the work at the present time in this country. This is especially true in regard to the making of Prothesis or artificial noses, either in part or total. It is my belief that in many instances it would be far better to give a patient an artificial nose or any part thereof, than to subject him to many operations and at the conclusion find the result to be, by far, not as good as when he has a good filling prothesis. In view of this fact, I have associated with me, Dr. Jesser and Dr. Bowmann, with whom I have had the pleasure of doing some of the work satisfactorily. Oftentimes some operative work is necessary in order that an artificial nose or any part of it can be better adopted.

RE-ESTABLISHING INTRANASAL DRAINAGE OF THE LACHRYMAL SAC.*

DR. HARRIS P. MOSHER, Boston.

Owing to the failure of probing to permanently restore the patency of the nasal duct when it is strictured and to cure the infection of the lachrymal sac which sooner or later usually accompanies such a stricture, and to the annoyance attendant upon wearing a style continuously, ophthalmic surgeons have, as a rule, abandoned this procedure and taking the bull by the horns, as it were, now excise the sac. When all the sac is removed suppuration naturally stops and the eye is rid of the constant danger of infection. Patients who have infected sacs suffer from periodical attacks of acute inflammation in the sac, but their chief and constant inconvenience comes from the continual overflow of tears. This makes reading a hardship and if their work calls for the exact use of the eyes, it is seriously interfered with or made impossible. Excision of the sac will cure the suppuration, but relief of the tearing cannot be promised for some months, if at all. Very often the operation is followed by no appreciable relief of the tearing. On this point I am aware that there is a certain amount of disagreement. I have taken the pains, however, to look up this question of the relief of tearing after excision of the sac and find that in a very considerable number of cases—in the first series investigated the percentage was 30 per cent—no betterment resulted. A second series is under investigation at the present time, and so far the percentage of failures is running high. It is only fair to state that some ophthalmologists put the percentage of failure as low as 3 per cent. If this was the percentage of the profession at large but little more could be asked. Probably no operation is more successful than this. However, if you get ophthalmologists in a confidential mood the impression you gain from them is that the operation of excision of the sac is unsatisfactory as far as the relief of the tearing is concerned in a large percentage of cases.

Nature intended the tears to run into the nose. The logical thing, to do, therefore, when this drainage is interfered with, is to attempt to re-establish it. A stricture of the tear passage at the junction of the sac and the beginning of the nasal duct is the

*Illustrations drawn by the writer.

cause of the damming back of the tears, and of infection of the sac. Strictures of ducts or canals lined with mucous membrane have always been difficult to get rid of permanently. Once strictured, always strictured applies not only to the urethra but to the nasal duct.

Probing having failed to give good results, excision of the sac became the favorite operation for the cases under discussion. Now the pendulum is swinging back, and numerous operations have been devised for re-establishing intranasal drainage. These operations are proving successful. It remains, of course, for the future to settle how permanent the results are, but to date they are very promising.

The following paper is the summing up of my experiences with twelve intranasal tear sac operations and twenty-five combined external and internal operations. I have permitted the paper to become somewhat long, I fear, and perhaps have burdened it with rather many details, but re-establishing intranasal drainage of the tear sac is still on trial and it is not possible as yet to tell just what details may prove to be significant or important.

I shall discuss first the results obtained in the intranasal tear sac operations. Of these I have done two series of cases. Next I shall take up the results of the third series of cases, namely, those operated by the combined external and internal method,—an operation which I have taken the liberty of calling the Mosher-Toti. Some of the intranasal cases have been operated a year or more, but in all of them more time must elapse before final results can be recorded. The same is true of the cases in which the combined operation was done, as the oldest case in this series is only a year old. After stating my results to date of the various cases, results which I hope are good enough to excite your interest, I shall review briefly the anatomy of the tear sac and of the nasal duct; refer, also briefly, to the intranasal operation on the tear sac and nasal duct, give my reasons for abandoning it, and then describe and discuss the combined external and internal operation.

Results of Cases. I have operated, as was just said, three series of tear sac cases. The first series was done a short time before the war: this consisted of five cases. The second was operated a year ago and contained seven cases. The third series consists of twenty cases of my own, two operated by house officers under my direction and three by Dr. C. T. Porter, making in all in the third series twenty-five cases.

In the first two series I did the intranasal operation, which I developed as an offshoot of the ethmoidal operation, in all but one case. This was my first combined external and internal operation. In the third series all the cases were operated by the combined external and internal operation.

In the first series all the cases have been lost sight of except one. This was my first private case and referred to me by Dr. Haskell. The patient had a mucocele of the right sac which had been present four or five years. The intranasal operation, which I have described in a previous paper, was done. She wore a thread through the canaliculus for two weeks and was probed at intervals during the first six months, five or six times. It is now three years since she was operated and she has not had any trouble up to three months ago. At this time she began to have some tearing when walking in the wind. I advised passing a probe again. She refused and has not been heard from since. In these intranasal cases one of the questions to be settled was how long a case would go after operation without the opening into the nose closing down. This case went at least two years.

The second series consisted of six intranasal operations and one combined external and internal operation. These were operated a year ago and the results were checked up recently. One of the six did not report. The results in the other five are known. One case was a failure, the other four resulted in a cure to date of the pus and of the epiphora. In these intranasal operations the wearing of a thread through the canaliculus was supplanted by the insertion of a small style improvised from silver wire. One patient wore this five weeks, the other patients two to three weeks. None of the successful cases were probed as part of the after-treatment.

The case which proved a failure has lately been re-operated by Dr. Porter and will be discussed with the cases which were operated by the combined external and internal method.

The intranasal operation, as these cases show, will give good results and I can say from my cases that the result will last as checked up so far, from one to two years. Why then, if the intranasal operation can give good results, have I abandoned it? I entered the lists some time ago with a tear sac operation of my own. Why do I, Spartan-like, abandon my own child? The reason is, that I got into trouble with the operation and nearly lost an eye. Then I tried the external operation. This proved to be a return to operating in the light after struggling in the dark. The comfort of being able at all times to see what I was doing was beyond

words. I felt from my first case of the combined external and internal operation that the constant danger of infecting the orbit which hangs over the intranasal procedure was over. It would have to be an extraordinarily beautiful, fussy and rich patient who could persuade me to go back to the intranasal operation.

The case which made me abandon the intranasal operation had, in brief, the following history: The patient was a woman in the fifties, who had had a suppurating tear sac for some five years. I did the intranasal operation which goes by my name. The sac was markedly distended and filled with pus. During the operation, as the pus kept welling from the punctum over the cheek, Dr. Gordon Berry, who was standing by, asked me how I was going to avoid infection. I answered that I hoped there would be sufficient intranasal drainage to accomplish this. At the end of the operation I saw to my dismay that I had entered the orbit, as there was orbital fat protruding into the nasal cavity. The orbit promptly became infected, and calamity followed calamity. Fortunately for me, the patient took everything as a matter of course and kept optimistic to the end. For three very weary months I followed this case, not knowing what would happen next. For the same length of time I stood the facetious remarks of my confreres on the eye side. Dr. Lancaster kindly took charge of the eye, followed it most faithfully, and encouraged me whenever he could. Before the spread of the infection was checked two incisions were necessary in the upper lid and one in the lower. The lower half of the cornea became one huge ulcer, in spite of our best efforts to prevent it. The ulcer perforated, but the globe did not become infected. In spite of the tension to which it was subjected the nerve came through undamaged. After the above complications were over, it took a month more before the eye was of normal size again and the patient could be discharged. Eight months after leaving the hospital she reported that her eye was weak, but she had no trouble with tearing. The operation, therefore, accomplished its purpose, but the eye was nearly lost in the process. I did three more intranasal operations after this one, as my back was against the wall. Two were without mishap, and one had trouble with paraffin injected in order to distend the sac and make it easier to find through the nose. It did not do this, but, instead, produced an abscess of the lower lid. The paraffin was finally recovered by incising the abscess and twice curetting it. With this case of infection constantly staring me in the face, I feel that if an intranasal operation of any extent is done on the lachrymal sac there is dan-

ger of a similar happening. This is why I have turned from the intranasal operation to the combined external and internal method, from an operation in the dark, carried out in great part by touch, to an operation done entirely by sight.

I have operated to date twenty cases by the combined external and internal operation. The first eleven of these have been recorded in great detail by Dr. Finck. These were done three to six months ago. The remaining cases, which are three months to a few weeks operated, I hope to have followed up and recorded in the same thorough fashion. In none of the cases of the combined operation have I dilated the punctum or slit it. I have preferred cases in which the punctum was not enlarged by previous slitting. I still feel that an intact punctum is necessary for a perfect result, but I have operated one or two cases in which the punctum was permanently slit for a millimeter or two and have gotten a good result. The only failure in the first eleven cases was a case in which neither the eye men nor I recognized a stricture of the inferior canaliculus. This case was operated for epiphora only and received no relief. We are trying to persuade her to submit to a tentative probing of the canaliculus, hoping in this way to restore its lumen. So far he has refused. In the first eleven cases of the combined operation one had a closed lower punctum and pus was coming from the upper punctum. I expected a poor result, but got a good one. Taking the results of all the cases in which the combined operation was done—twenty-five in all—the results to date are so good that I feel we have the operation of excision of the sac on the run. The results summarized are: All the cases have been relieved of pus. In all but one—the case of stricture of the canaliculus—the epiphora began to clear up between the second and the fourteenth day, to cease in two weeks in most of them, or within six weeks in all but two. In these two cases in place of constant tearing there is tearing now two or three times a day, every three or four days, or when the patient gets a cold. All these cases must be watched for a year or more before the final results are known.

The question at issue is, can excision of the sac—an admittedly illogical operation, but the best operation up to the present time—show as quick results, as good results, or deal so successfully with the difficult cases? I have the feeling that it cannot, and I hope a year from now to fully prove that it cannot. Even the results of the straight intranasal operation I feel have shown themselves, after a year, to be better than the average results of excision.

Summary of Tear Sacs—November 15, 1920. Combined External and Intranasal Operation.

Number of cases: 11. Ages of patients vary from 8 years to 64 years. Frequency of epiphora before operation: Practically constant epiphora, 3 cases; every 5 to 10 minutes, 2 cases; every 15 minutes, 3 cases; every 30 minutes, 2 cases; three times a day, 1 case.

Pus: Pus discharging from lachrymal sac into conjunctival sac at time of operation, in all 11 cases. Duration of pus discharge varied from 8 months to 26 years.

Probing of lachrymal tract before operation: 1 case, once; 1 case, 4 times; 2 cases, 6 times; 1 case, 12 times; 6 cases, not probed.

History of lachrymal abscesses in 4 cases.

Fistula into lachrymal sac at time of operation: 1 case, 1 week duration; 1 case, 10 months' duration; 1 case, present since infancy—12 years.

Canaliculus slit before operation: 1 case (List).

Lower punctum closed before operation: 1 case (McGowan).

Condition of Nose: Clinically negative in 10 cases. 1 case—sinus disease on same side, antrum and ethmoid had been practically cleared up by operation 2½ months previous to sac operation.

X-Ray of Sinuses: Negative in 7 cases; 1 case, thickened mucous membrane of antrum; 1 case, old antrum and ethmoid disease, apparently relieved by operation; 1 case, clouded ethmoid cells on both sides, but clinically negative.

Previous attempts at excision of sac, made in 2 cases. Stevens, McGowan.

OPERATIVE PROCEDURE.

Intranasal Work: Anterior tip of middle turbinate removed, 11 cases; anterior ethmoid curetting, 2 cases.

External Incision: Killian frontal sinus type, 9 cases; angular incisions, 2 cases (List, Nobbs).

Condition of Sac: Walls more or less adherent in 2 cases; pus in other cases.

Nasal Mucous Membrane Flap: 8 cases, sutured anteriorly; 3 cases, no flap.

Post-Operative: Pressure bandage 48 hours; original nasal pack undisturbed from 1 to 4 days; 3 cases, 24 hours; 5 cases, 48 hours; 2 cases, 4 days.

Post-Operative Edema About Lachrymal Region: None in, 3 cases; 8 cases, onset on 2nd or 3rd day, duration 2 to 8 days; average duration of edema in these 8 cases, 4½ days.

Post-Operative Muco-Purulent or Mucoid Discharge of Any Description: 2 cases, none; 6 cases, onset from 3 to 6 days after operation, average duration 5 days; 2 cases that had had previous unsuccessful attempts at excision of the sac, leaving one with a fistula and the other with a closed lower punctum, a slight discharge kept up for two weeks in one, and four weeks in the other; 1 case, 5 weeks after operation, the lower end of the incision began to discharge muco-purulent material; there was no epiphora, however, and this cleared up in 2 days (Helstein).

Tendency to External Deformity: 8 cases, seen 10 weeks after operation; 1 case, Keloid of scar—10 weeks after operation it was not noticeable with glasses on; 1 case, slight thickening along line of incision after 10 months; 1 case, contraction of scar—this patient had previous sac operation with closure of lower punctum (McGowan).

Fluorescein Tests: Tried in 9 cases. Passes from conjunctival sac into nose in 8 cases, varying anywhere from 12 days to 6 weeks after operation; 1 case, which failed, only $2\frac{1}{2}$ weeks had elapsed since operation.

Course of Epiphora: In 10 cases out of 11, epiphora completely stopped—anywhere from 3 days to 6 weeks after operation; 1 case—which had a closed lower punctum, and a previous attempted excision of sac, the epiphora 10 weeks from operation was reduced from being constant to once in 1 or 2 days (McGowan).

Of the 10 cases: 2 cases, epiphora stopped in 3 days; 1 case, epiphora stopped in 6 days; 1 case, epiphora stopped in 7 days; 1 case, epiphora stopped in 12 days; 2 cases, epiphora stopped in 13 days. Thus 7 cases, or two-thirds of the cases, were rid of their epiphora in 8 days on the average; the other, 3 cases, or less than one-third, had complications. 1 case, which had a fistula since infancy, was clear of epiphora in $3\frac{1}{2}$ weeks (Diamond); 1 case, which had had previous attempted excision of the sac, with a resulting fistula, was relieved of epiphora in 4 weeks (Stevens); 1 case, which tended to form a keloid in the post-operative scar, was rid of epiphora in 6 weeks (Bourasso).; 3 cases, no nasal mucous membrane flap was retained; 2 cases, epiphora cleared up entirely in 3 days, and in 7 days in the third (List, Kelley, McDonald).

ANATOMY.

Two bones, the lachrymal and the ascending process of the superior maxilla, make almost the whole of the bony fossa in which the lachrymal sac lies, and of the bony canal in which the nasal duct is carried along the outer wall of the middle meatus to the outer wall

of the inferior meatus just below the upper rim of the inferior turbinate. A short spur from the inferior turbinate completes the duct at its lower posterior part (Fig. No. 1.). From the practical standpoint this small bit of bone can be disregarded. One of these two bones, the lachrymal, is paper thin, whereas the other is sturdy.

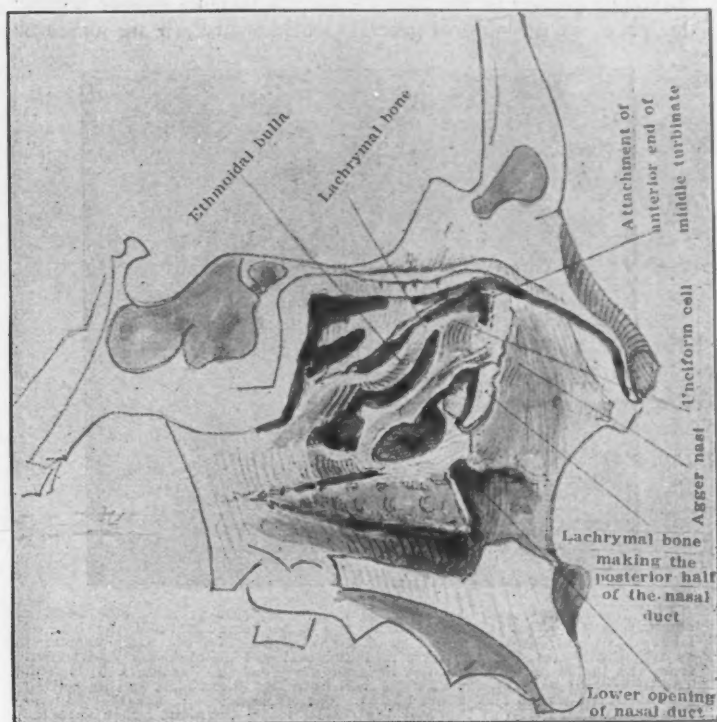


Fig. 1. Natural size. Drawing of an antro-posterior median section of the cleaned skull to show the unciform process. The middle turbinate has been removed. Note how the upper part of the unciform process mounds inward, making the inner wall of the unciform cell and then runs forward onto the inner face of the ascending process of the superior maxilla. The lower half of the inner face of the lachrymal bone where this appears in the unciform fossa is shown.

The lachrymal bone makes the posterior half of the depression in which the lachrymal sac lies and the posterior half of the canal for the nasal duct. The grooved posterior edge of the ascending process of the superior maxilla makes the anterior half of the lachrymal fossa and the anterior half of the nasal duct. The inner lip of the

ascending process of the superior maxilla becomes thicker as it ascends. Opposite the attachment of the anterior end of the middle turbinate it thickens into the ridge known as the agger nasi. Following downward from this point until the attachment of the inferior turbinate is reached, it is found that the inner lip of the ascending process of the superior maxilla becomes thinner until it has about the thickness of paper. One ethmoidal cell, the unciform

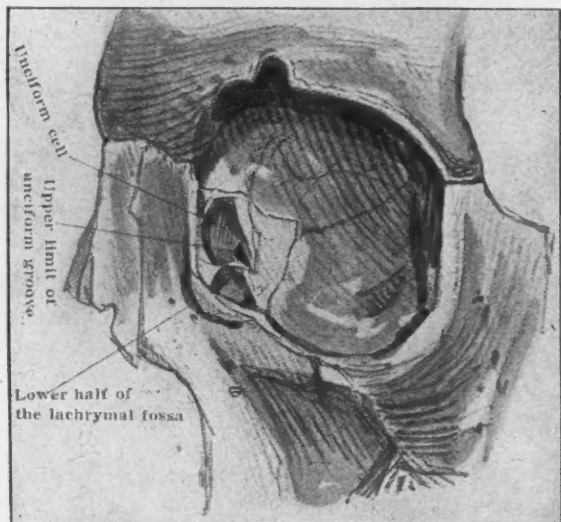


Fig. 2. Natural size. Drawing of the inner wall of the orbit from a cleaned skull. The lachrymal bone has been removed from the line of lachrymal crest forward. This drawing is made from the same specimen as drawing No. 1. The unciform or lachrymal cell which there was shown from the inside and unopened is here shown from the outside and opened. The lachrymal sac extends upward well onto the outer wall of this cell so that in dealing with the lachrymal sac from the nose it is necessary to go through the inner wall of this cell, that is, to break down the upper anterior part of the unciform process.

cell, and one process of the ethmoidal bone, the unciform process, come into relationship with the lachrymal bone (Figs. No. 1 and No. 2).

THE UNCIFORM PROCESS.

The unciform process is a thin flake of bone, shaped roughly like a scimitar, which springs from the anterior end of the ethmoidal labyrinth half way between its inner boundary, or the middle turbinate and its outer boundary, or the lachrymal bone. The unciform process starts downward parallel with the lachrymal bone, but soon swells inward. Its anterior edge embraces the inner surface of the

upper part of the ascending process of the superior maxilla, while its posterior border forms the upper limit of the unciform groove (Figs. No. 1, 2, 3). Below this swelling it bends outward and its inner face attaches itself to the lachrymal bone. In this way a sizeable ethmoidal cell is formed to the outside of the upper third or half of the lachrymal bone. Below the inward mounding caused by this cell, the unciform process narrows markedly and makes a partial twist on its vertical axis, bringing the anterior edge in contact with

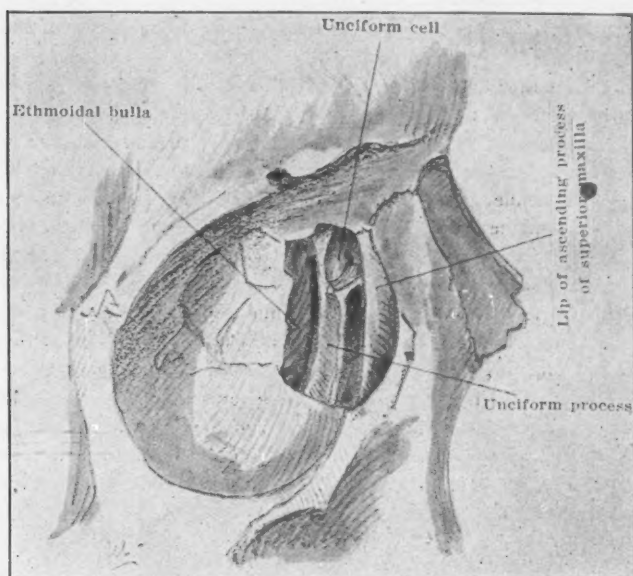


Fig. 3. Natural size. Drawing of the inner wall of the orbit from a cleaned skull. The lachrymal bone has been removed, exposing the unciform process. At the upper part of the unciform process the unciform or lachrymal cell is seen. Below this cell the anterior edge of the unciform process fits into the groove of the lachrymal bone which on the orbital surface makes the lachrymal crest. In this instance it articulates with the whole length of the inner surface of the crest. In many instances it articulates with only the upper part of the inner surface of the crest.

the inner surface of the lachrymal crest of the lachrymal bone. As before, the posterior edge of the unciform process continues to make the anterior boundary of the unciform groove. By this maneuver a V-shaped slit, the apex of which is anterior, is left between the unciform process and the lachrymal bone. The anterior boundary of the unciform cell is made by the posterior surface of the ascending process of the superior maxilla, and at this point may measure from 0.5 to a full centimeter.

THE UNCIFORM FOSSA.

The unciform fossa is the field of the operation described in this paper. It is bounded posteriorly by its most prominent landmark, the posterior edge of the unciform process; anteriorly by the posterior edge of the ascending process of the superior maxilla; superiorly by the inward swelling made by the unciform process; and inferiorly by the upper rim of the inferior turbinate. When it is stripped of mucous membrane and periosteum, its floor is seen to be made by the lachrymal bone, the unciform process, and by a small membranous area in the lower portion of the fossa between these two bones. As a rule the unciform process dominates the fossa, but the size of the process varies greatly. In the common type, the unciform process makes the posterior inferior quadrant, and then becoming broader, extends forward and upward and overlaps the inner surface of the ascending process of the superior maxilla, thus filling the whole upper half of the fossa. The inferior anterior quadrant is made by the lachrymal bone and the membranous area. In this quadrant anteriorly, the nasal duct comes to the surface behind the ascending process of the superior maxilla. The posterior inferior corner of this quadrant is membranous. The membranous area is about a centimeter in front of the ostium of the antrum and on a line with it. An opening made through it leads to the unciform groove and into the antrum. When the unciform process is narrow, 1.5 cm. of the nasal canal appears in the fossa as well as an area of the lachrymal bone behind the line of the lachrymal crest, which measures vertically a centimeter and transversely 0.5 cm. The membranous area in such cases measures 0.5 cm. in both diameters.

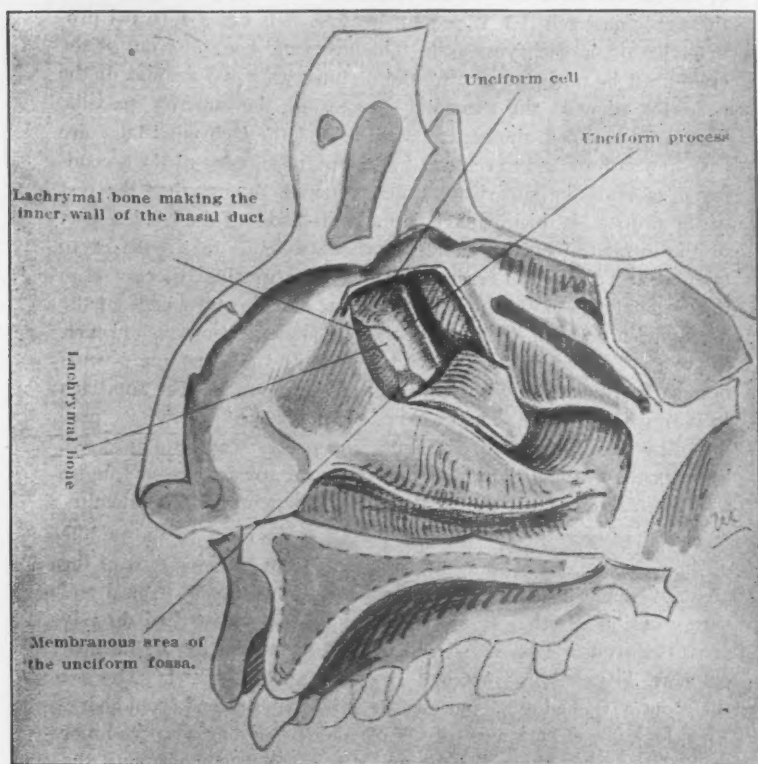
THE UNCIFORM OR LACHRYMAL CELL.

The unciform cell occupies the space between the upper part of the unciform process and the corresponding portion of the lachrymal bone. The unciform process owing to its pronounced inward mounding makes the upper, the posterior, the inferior, and the inner wall of the cell (Fig. 2). The outer wall is made by the upper half or two thirds of the lachrymal bone. The cell extends the whole width of the lachrymal bone, and comes into relationship with the upper half of the lachrymal sac.

THE LACHRYMAL SAC AND THE NASAL DUCT.

"The lachrymal sac is so placed that its highest part extends somewhat above the internal palpebral ligament (2-3 mm.). On the back of the sac lies the belly of Horner's muscle (Fig. No. 11), arising from the so-called reflected tendon of the orbicularis. The diameter

of the sac when distended is about 6 or 7 mm., its length about 12 mm. The length of the succeeding nasal duct is very variable. According to von Gerlach, it is from 12 to 14 mm., about the same as the sac. He states that it is often prolonged at the lower end in the thickness of the mucous membrane so as to reach a length of 20 mm. Frozen sections show that in the undistended state the antero-posterior diameter of both sac and duct exceeds the vertical. The



distance from the posterior border of the nasal opening is given by Alt as 30 to 35 mm., by von Gerlach as 28 to 30 mm. In no one of eight measurements by Dr. Tenny was it as much as 28 mm. Valves have been described in various parts of the tear passages. They are for the most part irregular and inconstant folds, and the best marked seems to be at the junction of the sac and the nasal duct. It is

rarely, however, a perfect valve. The opening of the duct into the inferior meatus, while presenting no true valve, is of a nature to impede regurgitation."*

APPLIED ANATOMY.

The chief points in the application of the foregoing anatomy are as follows:

In order to uncover the whole of the anteroposterior diameter of the sac the lachrymal or unciform cell must be opened. So must the agger nasi cell if it is present because it is but a forward prolongation of the lachrymal cell. The lachrymal bone in front of the crest must be taken away also and so must an equal amount of the posterior edge of the ascending process of the superior maxilla. The lachrymal cell, the agger nasi cell, and the lachrymal bone are easy to perforate and to remove, but the posterior edge of the ascending process of the superior maxilla, although thinner than the rest of the process, is thick enough to make its removal the hardest part of the intranasal operation. A conchotome tends to slip off or to take too big a bite and crack the bone. It is possible, of course, to uncover only the posterior half of the sac and leave the edge of the ascending process of the superior maxilla alone. In order, however, to get a good view it is necessary to deal with the ascending process because its thickness directly in front of the sac makes the approach to it round a corner. The obstruction of the view of the sac produced by this thickness of the ascending process can be minimized, however, by pushing the inner wall of the sac toward the septum by a probe introduced into the sac through the punctum and canaliculus.

The attachment of the internal palpebral ligament to the middle of the anterior edge of the bed of the sac—I am speaking now of the anatomy which concerns the external operation—makes it hard and slow work to lift the sac from its bed if it is approached directly from the front. The sac is held clasped in its bed by the internal palpebral ligament in front and Horner's muscle behind. The sac shells out of its bed much more easily if it is approached from above. Therefore, the elevation of the periosteum should begin on the inner wall of the orbit above the sac and continued downward until the sac is thoroughly out of its bed and the upper end of the nasal duct exposed. In making the bony opening into the nose, advantage is taken of the thinness of the lachrymal bone to make the initial opening through this in front of the crest, and to work forward onto the ascending process of the superior maxilla rather than to begin the

*Dwight: *The Anatomy of the Orbit*, in Norris and Oliver: *System of Diseases of the Eye*, 1, 94.

bone opening in the ascending process where the bone is hard and to work backward. By working from behind forward the operating time is very considerably shortened.

HISTORY OF THE INTRANASAL OPERATIONS ON THE TEAR SAC.

Years ago an ophthalmologist, whose name I do not recall, obtained temporary relief in tear sac cases by forcing a probe through the inner wall of the sac into the nose. Naturally this procedure did not become popular. In 1913 at the International Congress in London, West reported a series of intranasal operations on the sac in which he claimed a large percentage of cures. Time has reduced the percentage of cures following his operation, but the credit belongs to West of reviving interest in re-establishing intranasal drainage of the sac as opposed to excision. Since West's original paper almost every ophthalmologist known to fame or on the way to fame, and not a few rhinologists in the same category, have published some kind of an intranasal operation on the tear sac. These vary from the comparatively slight procedure of uncovering the inner wall of the sac through the nose, making the inner wall present in the operative field by a probe introduced into the sac, followed by the removal of the accessible part of the inner wall of the sac; to procedures which attempt to uncover the whole of the inner wall of the sac and of the nasal duct to the upper border of the inferior turbinate, followed by a thorough removal of the whole of the bony bed of the sac and the nasal duct from the nose side and an attempt to remove the whole of the inner wall of the sac and the nasal duct. In the more extensive of these operations—to which class, the operation which bears my name belongs—the anterior end of the middle turbinate is removed as a part of the operation and the anterior ethmoidal cells curetted. Time may show that the minor procedures may work as well as the more ambitious ones. I feel, however, that if you are dealing with strictured tissue you must deal with it radically or be prepared to deal with it continually.

About ten years ago Toti began to do an external operation on the lachrymal sac. He was led to this by observing how splendidly the sac is exposed in the ordinary external ethmoid operation. The same thought about this method of exposing the sac occurred to me and I have remarked upon it more than once to my assistants while doing the Killian operation. Toti's operation is briefly as follows: He exposes the sac by the usual ethmoidal incision shortened a little. Then he exposes the nasal mucous membrane where it covers the inside of the ascending process of the superior maxilla by chiselling away the posterior edge of the ascending process in

front of the lachrymal bone. Having removed enough of this process to allow him to do so, he makes an opening through the nasal mucous membrane and then makes a corresponding opening through the inner wall of the sac and by sutures anastomoses the two openings. As he works mostly through the ascending process of the superior maxilla, he does not find it necessary, as a rule, to remove the anterior end of the middle turbinate, or to curette the anterior ethmoidal cells.

When I did my first external operation I thought that I was to do the Toti. I found at once that the suturing was altogether too delicate a job for my fingers and in place of it I cut the nasal mucous membrane in halves where it was exposed opposite the sac and sutured the anterior flap outwards over the anterior edge of the bone opening into the nose. I attempted to suture the posterior half of the nasal flap to the posterior edge of the sac, but had little success. Finding that Toti's anastomosis was beyond me, I frankly removed the whole of the inner wall of the sac. Later I gave up saving any of the nasal mucous membrane and now cut it away to the full extent of my bone opening. I made other changes in the operations as described by Toti. These will be given in the description of the operation as I now do it. But to return to the Toti operation: To Toti belongs the credit of reviving the external operation on the lachrymal sac, for the purpose of re-establishing intranasal drainage. He paved the way and full credit belongs to him. Dr. Verhoeff thinks my procedure radically different from Toti's. Perhaps it is, but Toti inspired it. Verhoeff's criticism of the Toti operation is that as it removes only a part of the inner wall of the sac and by anastomosing the sac and the mucous membrane of the nose still preserves the sac, there is a chance of the anastomotic opening narrowing and finally reproducing a non-draining sac. This sounds plausible. I am convinced that the suturing of the sac and the nasal mucous membrane is too difficult and tedious to become popular. If my modification of the Toti operation gives permanently good results it will prove that Toti's technique was unnecessarily complicated.

THE COMBINED EXTERNAL AND INTERNAL OPERATION.

First Step. Previous to the etherization of the patient or during the later stages of it the nasal mucous membrane and the turbinates are shrunk with an adrenalin spray or by a packing of gauze soaked in adrenalin. A post-nasal plug is inserted by sight. I am accustomed to operate the patient sitting in a chair with the head held by an assistant. The lids of eye involved, the eyebrow, and the upper

part of the nose are cleaned in the usual manner, finishing with the application of iodine. The eyelids are held together and the cornea protected from accidental trauma by keeping the lids closed after anointing them with White's ointment, by a strip of adhesive plaster passed from the upper to the lower lid. This is placed over the middle of the outer half of the globe. If there is an obstructing deviation of the septum high up, it is better to resect this portion of the septum as a part of the first step of the operation or to do it before the operation is undertaken. Unless it is necessary to correct a deviation of the septum, the first step of the operation is the removal of the anterior end of the middle turbinate. After this is done the nose on the side of the operation is repacked with adrenalin gauze.

Second Step. The second step of the operation is the exposure of the lachrymal sac, freeing it from its bed and turning the sac and the adjacent soft tissues outward. The sac is approached through an incision over the ascending process of the superior maxilla. The incision is made about 7 mm. from the inner canthus of the eye. It starts at the level of the crease in the upper eyelid which marks the summit of the globe, and runs down in a nearly straight line and parallel with the posterior edge of the ascending process of the superior maxilla where this makes the anterior boundary of the bed of the sac. The incision is stopped 2 or 3 mm. below the inner limit of the lower rim of the orbit. The whole length of the skin incision is outlined first. Then the knife is carried through the soft tissues and the periosteum to the bone. The free bleeding which occurs at either end of the incision is controlled by placing a small Michel clamp at either place. These clips were introduced for suturing the skin. I use them to control hemorrhage in mastoid work and in operations on the face, such as the Moure operation for malignant disease of the accessory sinuses. They take the place of snaps and do not dangle in the field of operation. I have found them a great help. In freeing the sac from its bed and in elevating the periosteum from the inner wall of the orbit I habitually employ a flat chisel about a quarter of an inch wide. It acts both as a sharp and blunt elevator. At times it is necessary to supplement this by the knife, especially about the anterior edge of the bed of the sac. The sac shells out of its bed most easily if it is approached from above. Accordingly the elevation of the periosteum of the inner wall of the orbit is begun just above the sac and then carried downward until the sac is thoroughly out of its bed and the beginning of the nasal duct is clearly seen. As the sac is being freed from its

bed the elevation of the periosteum of the inner wall of the orbit is carried backward a little, that is, for 2 or 3 mm. beyond the crest of the lachrymal bone. By working in the manner outlined it has so far been easy in all cases to define the limits of the sac regardless of the presence of fistulae, and of previous attempts at excision.

If the sac does not present clearly, a slight enlargement of the incision upward readily brings it fully into view. If, however, the incision is carried upward to any great extent it will be found when it comes to suturing the wound that a dead space has been created in the soft tissues at the upper end of the incision which requires a buried suture to obliterate it. In some of my earlier cases a non-draining pocket was formed, which required the opening of the incision at the upper part.

The Third Step. The third step in the operation is to make a bone opening into the nose which at least equals the height and width of the sac. If the sac is excessively dilated it is not necessary, of course, to make the bone opening fully equal the size of the sac. The bone opening, however, must be made large enough to receive easily the outer wall of the sac after the inner half or two-thirds of the sac have been cut away.

The initial opening into the nose is made by breaking down the lachrymal bone in front of the crest. This is readily accomplished by the point of a knife, by a small flat chisel which is used as an elevator, or by the end of a small punch. A sufficient opening is made in the lachrymal bone to permit the introduction of the smallest Kerrison punch or any similar instrument, like that of Citelli. With this the rest of the lachrymal bone in front of the crest is bitten away and then the posterior edge of the ascending process of the superior maxilla where this makes the anterior half of the bed of the sac is removed. As was said above, the bone opening into the nose must at least equal the height and width of the sac. This accomplished, the inner wall of the nasal duct is bitten away with a small punch (Lang's) to the level of the upper rim of the inferior turbinate.

The Fourth Step. The fourth step of the operation consists in the removal of the inner half of the wall of the sac, or if the sac is greatly dilated, of the inner two-thirds. In addition, the inner wall of the nasal duct is removed. The inner bony wall of the nasal duct was removed in connection with the third step of the operation. The removal of the inner half of the wall of the sac is accomplished with forceps and scissors. The removal of the inner wall of the nasal duct with a small punch. It is essential, of course, to leave the outer

half of the sac because in this, at the level of the inner canthus the common punctum is placed.

In distended sacs the punctum is never endangered, but care must be taken in cases where the sac is small. The mucous membrane of the nose is sacrificed where it presents in the bone opening and trimmed flush with the margins. The region of the nose opposite the bone opening and into which from now on the punctum is to drain, is made free from tags of middle turbinate and overlapping ethmoidal cells. This is done in order that the granulations which occur during the healing process may not encroach on the punctum, and, in case this is surrounded by granulations caused by the supuration in the sac—and I have encountered two instances of this condition—seal it off and defeat the success of the operation.

After replacing the soft tissues I have usually sutured the skin incision loosely and paid no attention to the underlying periosteum. Dr. C. T. Porter, who has helped me in some of these operations and who has operated three cases of his own by this method, has sutured the periosteum of the ascending process of the superior maxilla to the anterior edge of the remaining part of the sac. He also makes his incision as straight as possible, feeling that sewing the periosteum and a straight incision result in a less conspicuous scar. Other operators in this neighborhood who have tried the operation above described have omitted the removal of the anterior end of the middle turbinate. I am not yet convinced of the wisdom of this modification.

The future may show that I lay too much stress upon getting a free space in the nose opposite the remaining part of the sac! Granulations and adhesions are the bugbear of all nasal operations, and many an operation which was at first a success has been nullified by them. In establishing intranasal drainage you seldom get too much room when healing is complete. For this reason I prefer to start with as much space in the nose opposite the punctum as can be quickly and easily secured. The removal of the anterior end of the middle turbinate is a trivial procedure. After the bone opening into the nose is made the overlapping ethmoidal cells can be dealt with through this by sight, using either a curet, a conchotome, or a ring punch, or the punch may be introduced through the nose and the removal of ethmoidal cells or tags of mucous membrane watched through the bone opening.

The operation is completed by freeing the nose of clots back to the postnasal plug and introducing into the nose opposite the bone opening a strip of vaseline gauze and packing the anterior ethmoidal

region lightly. If there was much pus in the sac only the upper part of the incision is closed, if not, the whole of it is sutured either with horse hair or fine silk. The eye is washed with salin solution and the cornea protected by smearing the inner surface of the lower lid with White's ointment. Pressure is produced upon the incision and the soft parts below, by building up a cone-shaped dressing with pledgets of cotton increasing in size from within outward, until the dressing is flush with the bridge of the nose. Over this a pressure bandage is applied. The removal of the postnasal plug and the cleaning of the vault of the pharynx in order to free it from stray clots of blood are the final steps.

It has seemed fair to me to call the procedure outlined above the Mosher-Toti operation. It differs from the original Toti operation in that no attempt is made to join the lachrymal sac to the nasal mucous membrane by making equal and opposite openings in each and anastomosing them by sutures. Toti preserved the sac as a sac. The chief objection to this—Verhoeff—is that the new opening into the nose may narrow after the fashion of anastomotic openings generally, and reproduce the old order of things. The essential modification that I have made in the Toti operation is to destroy the sac as a sac, preserving only the essential part of it—namely the outer wall and the punctum. I also sacrifice the nasal mucous membrane where it is exposed by the bone opening into the nose.

THE AFTER-TREATMENT.

The after-treatment as I have carried it out so far is as follows: The pressure bandage is kept on the eye for two days, being removed temporarily each day for washing the eye with boric solution and reanointing the lids with White's ointment. The nasal packing is removed in one to four days, according to the amount of bleeding which followed the removal of the anterior end of the middle turbinate and the anterior ethmoidal cells. I am, however, leaving the packing in a shorter and shorter time.

In many of the cases no edema appears about the wound and it heals by first intention. If there is much pus in the sac I expect edema for four or five days. This may involve the inner half of both lids. If there is much pus I do not expect healing by first intention and either frankly keep the lower half of the wound open or open it at the first sign of puffiness. In such cases the incision suppurates a few days, but generally cleans up within a week. I have been repeatedly surprised to have even cases which had a fistula at operation heal by first intention. While the wound is suppurating the operator can use any treatment he thinks best. I have usually

had the eye cleaned two or three times a day and employed hot corrosive poultices every three or four hours. I have been surprised how little suppuration of the wound there is as a rule and what a mild course it runs. There has been no case of infection of the orbit nor any suspicion of such an infection. In one case where there was a fistula there was a mild attack of keratitis. This cleared up in four or five days. It involved the lower rim of the cornea, in the region indicated by six o'clock and covered an area of half a centimeter in either diameter.

THE LESSONS FROM A FAILURE.

The case in the second series which proved to be a failure had the following history: The patient was a woman in the sixties, who had had a suppurating sac for years. The duct had been probed repeatedly and the canaliculus was widely slit. I operated by the intranasal method. She wore a silver style for a few weeks and then it was removed. For some months she was better; the pus disappeared, and there was but little tearing. Then the tearing got worse and a No. 7 probe was passed at intervals. At times she would go without the style, and then it would be put back and left in place three or four weeks. This went on for a year, probing at intervals, wearing the style, leaving it out and then going back to it. Finally it became hard to probe the channel into the nose and she had an acute flare up in the sac. At first I put down the lack of success of the operation to the fact that the inferior canaliculus was so widely slit. I became suspicious of this explanation, however, after operating by the combined method two cases with a good result in which the canaliculus after slitting had remained open for some 2 mm. She was a most willing and long suffering patient, and I proposed another operation and she accepted it. After the acute condition had quieted down, Dr. C. T. Porter, as I was off service, operated for me.

We were particularly interested to see how much of the sac had been left by the previous operation. It was apparently intact. On removing the inner wall as is done in the combined operation it was found that the opening through which the probe had passed all these months, and through which the style had entered, was about 2 mm. below the punctum. In other words, the probe had made the familiar false passage. It was supposed that at the first operation the lower two-thirds of the inner wall of the sac had been slit and a generous amount of this inner wall removed. Yet the sac had reformed. The inner wall of the nasal duct above the lower turbinate had been slit at the first operation, the bone about it removed, and the inner wall

of the duct bitten away. Nevertheless the upper part of the duct had reformed.

Dr. Porter succeeded in probing the upper canaliculus. At first it seemed as if the common punctum was blocked. After a little manipulation, however, it opened up. Finally also, the probe was passed from the region of the lower canaliculus through the common punctum.

It is now about a month and a half since the operation and the patient reports that the operated eye is as good as the other one.

This case is of extreme interest to me because it shows what can happen in the intranasal operation. If the operator works on a probe in the sac and nasal duct as a guide, the passing of the probe may make a false passage. Furthermore, even after the intranasal removal of the inner wall of the sac the sac may reform. In spite of diagrams in the articles on the intranasal operation to the contrary—and my diagrams are included—I feel that much less of the sac wall and of the nasal duct is removed than the operator thinks.

Another point in connection with this case is that a slit canaliculus does not prohibit a good result in the combined operation if the other canaliculus is working. The result may not be perfect, but it can be a good practical result. The boy on whom I operated, who had his lower punctum obliterated, and who presented himself with a swelling above the inner canthus with pus coming from the upper punctum, was cured of the pus and after operation had tearing two or three times a day every three or four days, instead of constantly as before. The upper canaliculus does not work as well as the lower one, but this case shows that it is capable of doing its work pretty well. The reoperated case just described shows the same thing.

The final point in connection with this case is, either, this operation was done poorly, and I have done enough surgery to escape being classified with the operator who never has a poor result or does a poor operation, or what happened in this case may happen in other cases operated by the intranasal method; that is, the sac may reform.

I have had one other case which parallels the one just recorded. It has not been reoperated, as I am out of touch with the patient.

DISCUSSION OF VARIOUS POINTS IN CONNECTION WITH THE COMBINED EXTERNAL AND INTERNAL OPERATION.

The Resultant Scar. In my first cases the incision used was about twice as long as that employed for the excision of the sac. I have gradually shortened it, however, until now it is little, if any, longer than the incision employed in removal of the sac. In the first case of this series I sutured the incision with metal clips. The result

was a marked and disfiguring keloid in the scar. I have not used the clips since, but I have gotten a bow string scar in a number of patients, that is, the scar is taut, curved, and stands out as a slight fold. In order to avoid this I have not only shortened my incision but have made it straighter and in two cases have tried the Verhoeff incision, that is, an angular incision with the base of the angle toward the nose. Dr. Porter, who helped me in my intranasal cases, and has given me valuable suggestions about the present series, feels that the straighter the incision the less tendency there is to the bow string scar. He has tried in the operations which he has done by the combined internal and external method, suturing the periosteum which is raised from the nasal bone to the anterior edge of the remaining portion of the sac. I shall try this procedure in some of my next cases. The bow string scar, however, occurs in but a small percentage of the cases. So far it is the only blot on the operation that has appeared. I imagine in the cases where this kind of a scar has occurred that it will flatten down in the course of six months or a year, but a sure method of avoiding it from the start would be welcome and an improvement in the operation.

The question of the length of the incision, its form and the amount of scar left by it has caused more discussion and more concern among the ophthalmologists with whom I have talked than almost any other point connected with the operation. From my experience with the scar which follows the external ethmoidal operation I had not realized that the scar question could so overshadow all others. The scar, for instance, which follows the ethmoidal operation is hard or impossible to find a year afterwards. Frankly, the keloid in the scar which followed in the case in which I used the Michel clips to close the incision was disfiguring. I used the clips for this purpose but once. Dr. Verhoeff thinks the use of his angular incision made as small as possible, will avoid all scar. It appeals to me, of course, to use as small an incision as one can and still see what he is doing. It is not surgical, however, to have the incision so small that the operation to be done through it has to be accomplished wholly or in part by touch.

I have wondered whether or not the fact that the incision lay over the bone opening into the nose and so had no underlying support, was the cause of the elevated scar. The same bone opening is made in the external ethmoidal operation and yet there is seldom a raised scar. If there is any deformity after this operation, which is rare, it consists in a slight sinking. The only difference between the ethmoidal skin incision and the incision made for the lachrymal sac

operation, except, of course, the difference in the length, is that the ethmoidal incision is usually made half way between the inner canthus of the eye and the bridge of the nose. This brings the ethmoidal incision further out, that is, nearer the bridge of the nose than the incision that I have usually employed in the sac operation. There is a natural fold in the skin which practically coincides with the inner boundary of the orbit. Where the lachrymal sac was not distended I have often made the incision in this fold. If, on the other hand, the sac was distended I have made the incision nearer the bridge of the nose in order to avoid cutting down directly on the sac and possibly opening it prematurely. I have the feeling that it is the slipping by of the two edges of the incision when it is made in this fold or too near it, that causes the bow string scar. If this is the reason, the skin incision can be made well outside the fold and the skin dissected up, and the incision through the periosteum made internal to it and along the rim of the orbit. In this way the two incisions will not overlies each other, and the fold is avoided. Future operations will have to settle whether it is by a straight incision, an angular incision, by avoiding the fold mentioned, or by separating the skin incision and the incision through the periosteum, that the bow string scar can best be avoided.

In response to follow up letters four of the recent cases reported today (April 25). They had been operated about two months. Dr. Porter and Dr. Finck checked them up with me. Three were relieved of both pus and epiphora and one had epiphora once or twice a day instead of continually. In all four fluorescein placed in the eye appeared in the nose. In two the scar was flat and barely visible. In one case in which both sacs had been done, on the right side the lower half of the scar was elevated, and on the left, the upper half. On neither side was the scar disfiguring. In the fourth case the whole length of the scar stood out like a bow string and was disfiguring. After examining these cases and talking them over we came to the conclusion that the bow string scar was probably due to making the incision with too much of a curve and to placing it too far inward, that is, too near the inner canthus. The bow string scar was nearest the inner canthus of the four incisions; the best scar was situated the farthest out. The bow string scar was in the fold previously discussed. We thought we made another observation. It was that where the ascending process of the superior maxilla and the adjoining surface of the nasal bone in front of it are flat the scar heals flat. In cases in which the bridge of the nose is low both the side of the nasal bone and the surface of the ascending process

are concave in anticipation of the curve of the orbit, the orbit in such cases really beginning on the side of the nose. In these patients the scar lies in a curved bed. In healing in this curved bed the two edges of the incision tend to override.

THE REMOVAL OF THE ANTERIOR END OF THE MIDDLE TURBINATE AND OF THE ANTERIOR ETHMOIDAL CELLS.

If any of the lachrymal bone is removed to make the opening into the nose the lachrymal cell is opened. Only by making the nasal opening entirely through the ascending process of the superior maxilla can this cell be avoided. The bed of the sac is made equally by the lachrymal bone and the ascending process of the superior maxilla. It simplifies and shortens the operation to make the initial opening into the nose through the lachrymal bone and then working forward, instead of working as Toti does from before backward, entering the nose first through the thick ascending process of the superior maxilla. Sometimes the ethmoidal labyrinth does not come far enough forward to overlap the inner surface of the ascending process of the superior maxilla. When this happens the removal of the anterior end of the middle turbinate and the curetting of the anterior ethmoidal cells may not be necessary. The removal of the tip of the turbinate is very simple and so is the removal of the ethmoidal cells which are found to the inside of the lachrymal bone, since they can be removed by sight after the opening into the nose has been made. Therefore I am loath to give up this stage of the operation. My conception of the operation is that a large space is necessary to the inside of the remaining portion of the lachrymal sac so that if granulations spring up anywhere from the cut surfaces they will be so far away from the punctum of the sac that they cannot possibly block it.

If an opening is made into the nose which is to stay open it must be large enough to prevent all contact with surrounding structures, especially during the stage of granulations through which every wound in the nose has to pass. It is possible that some of these cases may have to be probed after the operation. This has not happened yet. Should the necessity arise, however, the more room there is in the nose in the region of the anterior ethmoidal cells the better. There is no reason why the ophthalmologist should not readily acquire the technique necessary to perform the intranasal part of the operation, because if he pleases he can do it all by sight after he has made the opening into the nose. It is small potatoes to say that the operation encroaches upon the preserves of the ophthalmologist and to try to modify it so as to make it entirely intranasal or entirely orbital. The personal element should be eliminated and the

mechanics of the operation and what gives the best results should determine the steps of it.

The Hydraulics of the Sac. Much has been said in the past about preserving the long arm of the syphon if drainage of the tears into the nose was to be retained or re-established. The success of the intranasal and of the combined internal and external operations show, however, that the essential part of the nasal duct lies between the two external puncta and the common internal punctum. I still believe that the ideal case for the operation under discussion is a case in which the two external puncta have not been slit and the common internal punctum not traumatized by the repeated passage of a probe. Up to a short time ago I held the opinion that a slit canaliculus would give a poor result in the attempt to re-establish intranasal drainage. The only case of my series of intranasal operations which was a failure as far as lessening of the tearing and the discharge of pus had a widely slit canaliculus which was beyond repair. This case, however, has been re-operated by the combined method and has a good result. In my series where the combined operation was done at least two cases had the canaliculus slit and it was open for some 2 mm., yet these cases have done as well as the cases with an intact punctum. It is worth while, I think, trying these cases of slit canaliculus. Time will have to settle in what proportion of them, if any, slitting of the punctum vitiates the result.

Blowing Secretions From the Nose Into the Eye. It has long been known that in cases where the nasal duct has been kept widely open with probes that the patient would at times blow mucus from the nose into the eye. No patient of the intranasal series or of the combined series has as yet complained of this.

Closure of the Lower Punctum. One case in which the lower punctum was closed and pus was discharging from the upper punctum was a good result on the pus and the tearing was obtained.

Use of the Probe. The probe can be used in order to make the inner wall of the sac present in the nose. This is a great aid in the intranasal operation. I once tried injecting paraffin into the sac. It did not help, and I could not recover it. The result was an abscess of the lower lid. The paraffin was finally removed by curet and the case to my surprise had a good result.

Obliterated Sacs. In three cases I was puzzled as to whether or not I was in the lachrymal sac. Both were old standing cases and one had recently recovered from an acute attack of suppuration. In such cases the sac may be partially or practically obliterated. In one of these cases there was an immediate good result, proving that I was in the sac. The result of the other is unknown to date.

Double Sacs. I have operated on both sacs at one sitting in two instances. Dr. Porter did the same in one case. There is so little risk of infection in the operation by sight—that is, by the combined internal and external operation—that operating on both sacs is justifiable. From the patient's standpoint it is a very great gain.

In only two of my cases have I been able to recognize the common punctum in the outer wall of the sac. I have always looked for it, but have avoided much manipulation or cleaning of the mucous membrane of the sac for fear of traumatizing it and starting up granulations. For the same reason I have so far refrained from trying to locate the punctum by passing a probe. I should think that the use of the lachrymal syringe filled with salt solution would be safe, and would help to locate the common punctum. When you can see the punctum it certainly is a satisfaction.

The sac wall in the cases operated varied from the thinness of a cobweb to the thickness of blotting paper. Some of the sacs were markedly distended, and the cavity of the sac easy to find, others were flat, the cavity partially or wholly obliterated, and very hard to distinguish.

Most of the pieces of sac wall sent for pathological examination were so traumatized that the structures were hard to differentiate. All, however, showed chronic inflammation, except one case, which proved to be tubercular. This patient had an uneventful recovery and has continued well over a period of some two months.

In cases in which a fistula existed, the opening of the fistula into the sac was surrounded by dark red, almost black granulations. In most cases when the sac was exposed it was of a slight bluish color. In one case where the patient had been in the habit of using argyrol the sac was dark blue and the interior of it almost black. This dark coloring instead of helping, made it difficult to be sure of landmarks after the sac was opened.

When the sac is small it is easy to take off rather more than the inner half and to come perilously near the punctum. In such cases it is better to slit the sac vertically and then to trim the overhanging edges. In enlarging the bone opening into the nose care must be taken in the region of the beginning of the nasal duct. The punch is liable to slip outward at this point and to bite into the lower part of the sac. This frees the sac from its moorings, as it were, and leaves it dangling, making the removal of the inner wall more difficult. When there has been difficulty in finding the lumen of the sac at its upper pole I have found it by making an incision lower down, and just at the beginning of the nasal duct.

At first I used a self-retaining retractor to expose the field of operation. This, however, put the sac so much on the stretch that it was a hindrance rather than a help. I now have the wound held open by retraction on the outer lip of the incision with forceps or small double hooks.

Two cases in the first series of intranasal operations were done under cocain. All the other patients have been operated under ether. I imagine that the combined operation can be done under cocain, my personal preference, however, is for the freedom which general anesthesia gives. In the case of old patients where it is inadvisable to use ether my present choice would be to excise the sac under local anesthesia, rather than to try the combined operation.

The amount of hemorrhage encountered in the combined operation varies with the case. Where there is a marked mucocele of the sac, especially if the patient is a woman, the bleeding is usually slight. In long standing cases in which there have been many attacks of acute inflammation, and in cases operated soon after the subsidence of acute inflammation, the bleeding is liable to be troublesome. Metal clips placed at the upper and lower ends of the incision have proved most convenient, and thoroughly efficient for controlling it. They are used not only at these two points, but wherever any annoying bleeding appears.

On one cadaver I found the common punctum protected by a crescentic fold fully 2 mm. high and 1 mm. broad. Beneath this was another and thicker fold made apparently of organized granulations. I thought I recognized such a crescentic fold over the punctum once in the living. How often this fold occurs and what its significance is I do not know. It may be analagous to the crescentic fold which often guards the opening of the nasal duct into the inferior meatus, or it may be of traumatic origin.

The part of the combined operation about the necessity of which I am most doubtful is the removal of the inner wall of the nasal duct. I have done this as a routine so far, but it would seem as if the removal of the inner half of the sac might be sufficient because the aim of the operation is to drain the punctum directly into the nose. Up to now I have gone on the principle that the larger the bone opening into the nose the greater the probability that it will remain sufficiently open to give permanent drainage. Temporary drainage of the sac into the nose is easy to accomplish. What we are after is an operation which will re-establish permanent drainage.

Instruments. The instruments for removing the anterior end of the middle turbinate and for curetting the anterior ethmoidal cells

are too well known to mention. The special instruments are the following: The familiar metal clips ordinarily used for suturing the skin but employed in this operation in place of snaps for controlling hemorrhage. A Cetelli punch for removing the anterior part of the lachrymal bone in front of the crest. A large Kerrison punch for removing the posterior edge of the ascending process of the superior maxilla. A small ring punch such as is used in ethmoidal operations. This is used for removing tags of ethmoidal cells and tags of nasal mucous membrane. A ring punch small enough to work in the bone opening into the nose. The blades should be at right angles with the shaft. Such a punch is very useful to catch the tags of nasal mucous membrane which border the bone opening and are very elusive. Lang's frontal sinus punch forceps with probe point. This is used to cut away the inner wall of the nasal duct. The blade is a little small but it is the best instrument that I have tried as yet for this purpose. A flat chisel about 4 or 5 mm. broad. This is used as a periosteum elevator, and for turning the sac out of its bed. If one feels that he wants to probe either canaliculus in order to locate the common punctum, the usual instruments are necessary for this, as are small eye forceps and scissors for dealing with the sac. Some form of probe is needed for locating the nasal duct and for exploring the cavity of the sac. The Yankauer probe for the Eustachian tube is very convenient for this purpose on account of its shape and its handle.

During the progress of this work the results have been reported twice, the first time at a meeting of the New England Ophthalmological Society and the second time in Washington. In the discussion of the paper at these meetings the points stressed were that many operators were satisfied that excision of the sac cured not only the infection but the epiphora, and that the operation which I described seemed radical and somewhat formidable. As I have said earlier in the paper I have looked up the results hereabouts of the operation of excision of the sac on the epiphora, and still firmly but politely differ from the opinion that the epiphora is lessened to the extent of not being annoying. On the other point I can assure those who think the combined operation is difficult, that it is probably easier than excision of the sac.

I have been asked whether I would do the combined operation on children. I have as yet had no experience with such cases. The youngest patient so far operated by me was 12 years old. Dr. Derby stood ready to refer a private case which was 4 years old, but I begged off. I might do differently with a hospital case. If

the results continue good in the adult cases I do not see why they should not be duplicated in younger ones. It must be remembered that in infants suppuration of the sac is often due to a minor embryological fault, namely, to delayed opening up of the nasal duct. If such cases are let alone and no false passage made with a probe, the duct generally opens.

Dr. Gowan of Walla Walla, Washington, has kindly allowed me the use of two case histories which illustrate this point. The first case, Barbara B., was born in the summer of 1914. One eye was noticed to have an obstructed tear duct when she was a few weeks old. Epiphora was always present and mucopurulent secretion could always be expressed from the sac. At no time would a colored solution instilled into the eye appear in the nostril. Only cleansing measures were used. The condition continued until about the end of 1917, that is for three years, when the trouble entirely cleared up. Since that time colored solutions instilled into the eye appear in the nostril.

The second case was a sister of the first. She was born in January, 1917. One eye similar in every way to that of her older sister, was noticed when she was a few weeks old. Only cleansing measures, together with expression were used. The condition disappeared spontaneously when the child was about six months old.

Where the duct does not open up, or has suffered from the use of the probe, I feel that after a reasonable time has elapsed such cases will eventually be operated by the combined method. I cannot imagine the intranasal operation being attempted.

I wish to express my hearty thanks to the Ophthalmic Staff of the Massachusetts Charitable Eye and Ear Infirmary for referring the cases on which this report is founded. Even after the mishap which proved to be the turning point in my operative procedures they continued to refer them and I did the intranasal operation twice after this. These cases happily went well. The members of the Ophthalmic Staff have continually supplemented my scant knowledge of the eye with their full knowledge, and have made many helpful suggestions. I am especially under obligation to Dr. Lancaster for pulling both me and my patient out of a bad mess. I refer, of course, to the case in which the eye was nearly lost from infection following the intranasal operation. Both Dr. Quackenboss and Dr. Derby have been very sympathetic with my attempts to work out the problem of re-establishing intranasal drainage of the sac. Dr. Verhoeff has helped also. He has thought enough of the combined operation to try it and to modify it. I am only afraid that he will perfect

it. In my first series of cases Dr. C. T. Porter helped me with expert eye knowledge, in the second series Dr. H. P. Cahill did the same, and in the third Dr. H. P. Finck. To Dr. Finck, also, I am indebted for the very full summary of cases which adds value to this report.

CONCLUSIONS.

Drainage of the lachrymal sac can be re-established either by the intranasal operation or by the combined external and internal operation. Either operation will cure suppuration in the sac and both will lessen or abolish the epiphora. Both operations are still on trial as to the permanency of their results. The intranasal operation is a blind procedure compared with the combined external and internal operation. There is constant risk of infecting the contents of the orbit if the intranasal operation is extensive. There is little such risk if the operation is done by sight by the combined method. In old standing cases of suppuration of the sac where its walls are thickened and the lumen partly or wholly obliterated the combined operation offers the best chance of success. In this very difficult type of case even the external operation may fail. If it seems unlikely to succeed at the time the operator may proceed at once to the extirpation of the sac, or wait to see whether or not he has successfully removed the inner wall. In such cases it is often hard to tell at the operation whether this has been accomplished or not. If the operation proves to be a failure, still the sac can be excised. Where an attempt has been made to excise the sac and failed—I have reoperated several of these cases—the external operation will readily expose what is left of the sac and any prolongations that may have developed. Where fistulae exist they are easily dealt with by the combined operation. Excision of the sac cures only pus in the sac. The combined operation will do the same and greatly alleviate or cure the epiphora.

The intranasal operation on the tear sac is in great part an operation by touch, the combined operation is an operation by sight. So far the occasional prominence of the scar is the only valid objection to the combined operation. Experience with the external operation should make the scar as inconspicuous as the scar left by excision.

Where light is possible it is folly to work in the dark. The best surgery is done by sight.

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CANCER OF THE LARYNX.

SIR ST. CLAIR THOMSON, London, England.

Introductory.—Twenty-five years ago this subject was still wandering in the wilderness of ignorance and disaster, and was only approaching the present promised land of progress. One-quarter of a century is but a moment of time in the long evolution of medicine and the record of our recent rapid advance in cancer of the larynx is one of the romances of medicine.

Let us first glance at the position of the matter in the last quarter of last century. In 1879 John Nolan Mackenzie was an assistant to Morell Mackenzie in London, at the Throat Hospital in Golden Square. In these days the usual treatment for this disease consisted in tracheotomy and subsequent removal, piecemeal, of the growth through the natural passages. Of this performance John Mackenzie writes as follows: "Of course, there was never a thought of cure. When I look back through the years in which I have seen cancer of the larynx maltreated, and in which I have unconsciously maltreated it myself, I am simply appalled at the retrospection."¹

At that time, forty years ago, Morell Mackenzie himself wrote of the disease in the following words: "As far as the present state of our knowledge extends, the only possible termination of any case of cancer is death, but at the same time the question must always arise as to how long life may last in any particular instance. The usual duration of epithelioma of the larynx appears to be about eighteen months."²

Let us just think that these words were written only forty years ago and let us look on that picture and on the one we can present today. It is one of the triumphs of surgery.

Two Pioneers.—This triumph is largely, if not chiefly, due to one American and one Englishman. Solis-Cohen made an epoch-making step when he urged that, in total laryngectomy, the lower end of the trachea should be fixed in the front of the neck and that any attempt at maintaining respiration through the mouth should be abandoned. So, too, Henry Butlin had the courage of a pioneer when he faced again the early disasters of laryngo-fissure and rescued it from the opprobrium which had at first threatened to condemn it forever.

The Evolution of Laryngo-Fissure.—Let us first review the history of thyrotomy. As long ago as 1867 Solis-Cohen performed a laryngo-fissure for epithelioma on a patient, who survived the operation and died twenty years later of apoplexy.³ The first eight cases of laryngeal cancer operated on in Europe by laryngo-fissure were carried out by the great surgeon Billroth, in Vienna, between 1870 and 1884. Six died of recurrence; one survived two years and nine months, and the eighth case was lost sight of.⁴ What a disaster! Paul Bruns recorded nineteen cases, of which only two survived a year.

One English surgeon, Durham of Guy's Hospital, had attempted in 1872, with the eye of a prophet, to point out that "an earlier, bolder and more ready resort to the method" was justifiable and encouraging.⁵ But his appeal for further study and experience of laryngo-fissure was overwhelmed by the great authority of Morell Mackenzie, who, in his book in 1880, wrote of it as follows: "It will thus be seen that the results of thyrotomy are extremely unsatisfactory. In some cases the operation was followed by immediate death, in others it could not be completed, and in the remaining cases, with two exceptions only, recurrence followed within a very short time. If the few statistics which have been collected, are to be trusted, the average duration of life after the operation is only ten months."⁶

It is curious that, even by those who afterwards achieved brilliant results, this very operation was at first condemned as hopeless. Thus, in 1883, Butlin, from the results obtained by other operators, concluded that "the disease is far too deeply seated to admit of removal by so slight an operation."⁷ Semon, also, in 1886, on the strength of literary information, formed the opinion that it should not be attempted;⁸ Moure, as late as 1891, concluded that thyrotomy "appeared a bad operation in established laryngeal cancer."⁹

Indeed, in 1883, Butlin categorically stated that "not the slightest encouragement is afforded by public accounts to induce one to perform the operation of thyro-fissure, or the sub-thyroid incision, for the removal of carcinoma, whether extrinsic or intrinsic."

Yet he began to perform it himself in 1886; and from 1890 he limited it to intrinsic cases. By that year he had operated on nine patients, of whom three died of the operation, three died of recurrence and, though the other three survived, sufficient time had not elapsed to claim a success. This will sound, compared with our records of only thirty years later, but a poor result; but our admira-

tion must be stirred for pioneers who could thus again attempt to capture a fort which had appeared to themselves to be impregnable. Doubtless many a mariner had been lost on the coasts of America before Columbus landed. Lennox Browne had stated that "with matured experience of the whole that may be gained by attempts at radical removal I now advise a simple policy of watchful inactivity in patients of advanced years." I may here interpolate, in passing, that I have performed this operation on a patient of 75 years, who was out for a walk on the tenth day, and is now well and free from recurrence four years after at the age of 79. Yet Lennox Browne, in 1899, inspired by the work of Butlin, ventured on the wise prophecy that "this is probably the radical operation of the immediate future, and attempts at such will, it is hoped, be limited to this measure, and to that class of cases for which it is indicated."¹⁰

It is clear that one reason of failure was the inadequate investigation of the diagnosis and natural progress of intrinsic cancer. Thus, Lennox Browne in his text-book in 1899, dismisses the laryngeal appearances of intrinsic epithelioma with a description of twenty-one lines! Similarly when Morell Mackenzie states above that "the usual duration of epithelioma of the larynx appears to be eighteen months," he is evidently writing of cases which we should call "advanced," *i. e.*, only diagnosed months, or even years after they have started, or else he had in mind those wretched sufferers who roused John Mackenzie's pity.

As recorded, Butlin started his laryngo-fissures in 1886. Like all pioneers he paid the penalty, for, by 1894, of fourteen cases, two had died from the operation (14.3%) and six from recurrence (43%). However, he had the satisfaction of recording that between 1890 and 1907 there was only one death among twenty-one patients (5%) and that ten cases were quite successful. Semon performed his first laryngo-fissure in 1891—only thirty years ago. He had the usual disappointment of explorers and his death rate at first was 25 per cent. Schmiegelow, Chiari and others in those days, by showing the necessity for acquiring operative skill and improving the technique, demonstrated that fatalities could be abolished or reduced to a minimum. Between 1900 and 1917 I operated on ten cases without a fatality and with only two recurrences. Between 1900 and the present date I have operated on forty-eight cases. There has not been a single death attributable to the operation, though, I regret to say, two patients were lost through errors in after-treatment. One death was undoubtedly due to an idiosyncrasy for heroin, of which a larger

dose (half a grain in all) was given than I had intended, within twenty-four hours. The other patient had a post-operative hemorrhage, which, I believe, would have been harmless had he not, through a mistake of orders, been given three-quarter grain of morphia in the first twelve hours. No patient of mine ever has had morphia before a laryngo-fissure and I am now determined that no patient in the future will ever have any derivative of opium after an operation.

By 1890 laryngo-fissure had established itself and, in addition to the men already mentioned, it is sufficient to refer to the works of Clinton Wagner, Koschier, Delavan and Chevalier Jackson.

Complete Laryngectomy.—If this story of the establishment of the operation of laryngo-fissure is one of the romances of medicine, the history of the progress of the operation for complete removal of the voice-box is also dramatic, and the results are encouraging although less brilliant.

Some of us can remember seeing that great surgeon Billroth standing in the operating theatre of the old Krankenhaus in Vienna. He was the first to perform a complete laryngectomy; the inception of the operation is, therefore, not such very ancient history. But the first efforts met with heartbreaking failure. Of the first twenty-five cases of total extirpation performed by various surgeons, not a single patient was alive at the end of the first year after operation! This mortality was chiefly due to the septic pneumonia (*Schluckpneumonie*) caused by the passage of food, blood and secretions into the lungs. The operation fell into the same disrepute which laryngo-fissure had met with in its early days. Let us therefore realize what a brilliant and bold suggestion was that of Solis-Cohen when he proposed to cut across the trachea, detach it completely from the larynx and trachea and fix its orifice to the skin in the middle of the neck. All communication into the mouth and nose is thus cut off and the great and immediate danger of the operation from swallowing-pneumonia can thus be averted. I remember seeing the patient Solis-Cohen brought across the Atlantic to show at the meeting in London in 1895—a year before *THE LARYNGOSCOPE* was founded. There can be little doubt that it is on this brilliant idea and on that demonstration that much of the subsequent work of laryngectomy is founded. Our Spanish colleagues appear to have had particularly large experience in it—possibly their cases do not present themselves in time for the safer and far less crippling operation of laryngo-fissure.

The cases in which it is suitable is shown by a recent record of six lasting and successful cases by Charters Symonds.¹¹

As the early diagnosis of intrinsic laryngeal cancer becomes more general, so will splitting the larynx become more common and complete laryngectomies become more rare. The latter operation will, in the meantime, still be required, for, as H. Arrowsmith well says, "a certain period of laryngeal malignancy justifies thyrotomy as clearly and definitely as a later stage makes laryngectomy imperative."¹² The dangers, difficulties, and drawbacks of total removal of the larynx are too well known to require recital.

Lateral Pharyngotomy for Laryngeal Growths.—"Partial laryngectomy is seldom indicated"¹³ but some of us have felt lately that while an improvement or alternative to laryngo-fissure for cancer situated round the glottis can hardly be imagined, there are other situations where the total extirpation of the larynx in an unnecessarily mutilating operation. It is for growths in the epilaryngeal region, or on the pharyngeal surface of the cricoid cartilage, that Wilfred Trotter and others in England are now studying the method of approach through the side of the neck and the lateral wall of the pharynx.¹⁴ It is well worthy of consideration.

Conclusion.—As Butlin truly said some years ago, extrinsic cancer of the larynx is "a dire disease." In certain sites, with the lymphatic arrangements supplying them, and with the frequent latency of symptoms until the disease is well advanced, it is difficult to see how this class of cancer can be other than one of the most deadly manifestations of the scourge of humanity. A small proportion of cases may be saved, unfortunately, in most cases, by a mutilating operation.

Intrinsic cancer is, happily, by far the more frequent type. Both the profession and the public must be educated to the possibility and importance of early diagnosis. This will furnish an increasing number of cases for laryngo-fissure which, in skilled and careful hands, is an operation of comparatively slight danger, while it leaves the patient with a useful voice and enables him to earn his living and take his place in society. As emphasizing the great importance of personal skill, experience and care, it is pointed out by Chiari that, in the records of different surgeons, the death rate varies from 0 per cent to 25 per cent, the recurrences from 0 per cent to 92 per cent, and the cures from 7.7 per cent to 87 per cent! Good results can only be obtained by meticulous care in diagnosis and operation, and, as Mackenty says, "it is the neglect of the small details following

operation that produces the mortality."¹⁵ But, with judgment and care, the operation of laryngo-fissure furnishes a proportion of lasting cures—some 80 per cent—which surpasses the results obtainable by operation for cancer in any other internal region of the body.

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ARE THERE CASES OF FOREIGN BODY IN THE LUNG IMPOSSIBLE OF BRONCHOSCOPIC REMOVAL?*

DR. CHEVALIER JACKSON, Philadelphia, Pa.

Your chairman has requested me to prepare a paper on the limitations of the bronchoscopic removal of foreign bodies from the lungs. It is not impossible that I may have to appear before you on some future occasion and acknowledge my present opinion a mistaken one, but herein is presented to you the outlook today as I see it.

In view of the developments of bronchoscopy, I have come to the conclusion that there are no fixed limitations to the peroral bronchoscopic removal of foreign bodies that have gone down into the lungs through the natural passages. Projectiles that have gone in through the chest wall may be too large to be brought up through the natural channels; but any localizable foreign body of appreciable size that has gone down these channels can, in my opinion, be brought back the same way; not the first time, perhaps; possibly not the third or the fourth time; but, if mortality be avoided, patient, concentrated endeavor will solve any problem of bronchoscopic foreign body removal. The only exception to this broad and sweeping assertion as to the unlimited possibilities of bronchoscopic foreign body extraction is in the case of foreign bodies that are so small as not to be localizable. It is obvious that a minute piece of pneumoconiotic material or a tiny fragment of peanut kernel, for instance, may get into a tiny branch bronchus and therefore cannot be located. It is impossible thoroughly to search the hundreds of minute bronchi and bronchioles of both lungs for tiny particles of foreign bodies that are non-opaque and hence not localizable. Non-opaque bodies of appreciable size can usually be located by the ray and always by the physical signs.*

In the case of a foreign body of appreciable size that may seem beyond the limits of bronchoscopy, one of four things will happen sooner or later, if the patient survive. These four things are:

1. The mechanical problem of disentanglement will be worked out, or

*Read at the Meeting of the American Laryngological, Rhinological and Otological Society, Eastern Section, New York City, February 26, 1921.

*Diagnosis and Localization of Nonopaque Foreign Bodies in the Bronchi. Amer. Journ. Roent., Vol. VII, No. 6, June, 1920, pp. 277-285.

2. A temporarily unreachable foreign body will be reached, or
3. The foreign body will shift to a location more favorable for removal, or
4. The foreign body will be loosened by suppuration, so as to be readily removable.

The limitations of anything mechanical are only temporary. When Morse invented the electric telegraph the limit of communication was a few miles. This limit was extended to thousands of miles. By development stages the limits were extended until they reached nearly the entire circumference of the earth, the limitations then being a continuous metallic conductor of sufficient area of cross section, and the necessity of sending only one message at a time. Then came the duplex with its two messages passing each other on the wire, doubling the capacity of the wire, to be followed quickly by the quadruplex with its fourfold transmission. Still the limitation of the continuous metallic conductor existed. With one great leap this limitation was swept away by Marconi in his development of means for dispensing with the continuous metallic conductor. Limitations still exist, but like the previous ones, they are not fixed limitations. These temporary limitations are being continuously set at wider and still wider radii. In the development of the telephone we have a parallel. Slowly and laboriously the telegraphic words were spelled letter by letter of the Morse alphabet, with the occasional relief of a sign for a few of the very common words. Such were the limitations when Alexander Graham Bell in the development of methods of teaching deaf-mutes discovered that human speech could be transmitted by a mechanism using the induction of permanent magnets. Here the limitations were in hundreds of feet. Then quickly came the interweaving of the electric transmission with the feeble inductive mechanism of the permanent magnets, extending the limits of telephony to thousands of miles over metallic circuits. Then came wireless telephony. Who shall be so egotistical as even to say there *are* fixed limitations to any mechanical development, let alone to name such limitations.

Bronchoscopy being purely a mechanical procedure seems justly comparable in its development and in the elasticity of its limitations to telegraphy and telephony. The difference is of degree, not of kind. Bronchoscopy is, relatively, but a tiny field. It might be said that bronchoscopy has one absolute limitation, namely, human life. But even this is but a temporary, not a fixed, limitation in that means for accomplishing the desired result without undue danger to life can be developed by patient, careful, concentrated endeavor;

that is but a mite as compared to the concentration being applied to the electromechanical developments of today. Let us call mortality a barrier to be circumvented rather than a fixed limitation.

Perhaps the best illustration of my meaning will be afforded by comparing the early work of the Bronchoscopy Clinic with the work of today.

In publishing a report of five early failures I stated:

"They should be considered as failures of bronchoscopy and should be analyzed as such in order that bronchoscopy, like any other department of medical science, shall profit by its failures."

Since that time I have studied faithfully on the causes of those failures and I think it may be said that, while they were bronchoscopic failures in the then-attained state of development, every one of the five foreign bodies would be easy of removal today. At the Bronchoscopic Clinic we have had a number of cases exactly paralleling each one of those five failures and in every instance the foreign body has been successfully removed, not always at the first bronchoscopy, but, by the thereat obtained information, a solution of the problem encountered was worked out in the laboratory by the rubber tube method, supplemented when necessary by subsequent tests on the dog. A few of the parallel cases will be cited for illustration.

Unsuccessful cases paralleled later by successful cases. In 1914, before this Society, I reported as beyond the limits of bronchoscopy the case of a dental root-canal reamer in an ascending branch of the left upper-lobe bronchus. That it was beyond the limitations of the bronchoscopy of that day is shown by the fact that four of us had tried every one of the then-known methods of bronchoscopy. There was at that time no instrument devised that would reach around the corner into the stem of the upper-lobe bronchus, to say nothing of reaching an ascending branch of the upper lobe bronchus of either the left or the right side. I believe my opinion was correct on the day it was expressed; but it is equally true that later developments have placed the upper-lobe bronchus, even the ascending branches of the left upper-lobe bronchus, well within the limits of bronchoscopy. We have had seven upper-lobe bronchus cases from which the following one is selected because it so closely parallels the previously reported case in which we failed.

Case No. Fdby. 643. On March 16, 1918, a man, aged 22 years, was referred to the Bronchoscopic Clinic for the removal of a dental root-canal reamer which had slipped from the fingers of a dentist while at work on the patient's teeth, about two weeks before admis-

sion. The only immediate symptom was a paroxysm of coughing that subsided in a few minutes. On the thirteenth day slight cough was noted; temperature was normal; there was no pain or dyspnea. Bronchoscopy in a distant city was stated as unsuccessful "because of bronchorrhoea." On admission to the Bronchoscopic Clinic a physical examination of the chest revealed:

Physical signs. Expansion good, seems equal. Slight impairment of percussion note over the upper left. Expiration slightly prolonged over left apex. Vocal fremitus relatively decreased over the lower left. No rales or friction.



Fig. 1. Dental instrument "around the corner" in an ascending branch of the left upper-lobe bronchus, dislodged by bronchoscopic, spiral, upper-lobe-bronchus forceps.

Dr. David R. Bowen made the following report of his ray study: "Metallic foreign body (dental instrument) in the left upper lobe bronchus."

First Bronchoscopy. At the first bronchoscopy the upper-lobe-bronchus forceps were found of insufficient length and of not quite the proper curve to reach the foreign body in this particular individual. Measurements of the needed changes in the forceps were taken approximately with the eye.

Second Bronchoscopy. A specially made upper-lobe-bronchus forceps with a curve suited to the bronchial tree of the patient was

passed through the bronchoscope into the left upper-lobe bronchus while Dr. David R. Bowen watched through the fluroscope. The disappearance of the foreign body from the upper-lobe bronchus was noted by Dr. Bowen, but on withdrawal of the forceps the foreign body was not in their grasp. Dr. Bowen made a large number of plates and reported as follows:

Second Roentgen-ray Report:

"From the very careful plate study, including the entire respiratory and alimentary tract, there is no evidence of the foreign body, a dental brooch, seen in the previous examination."

The foreign body was not found in a careful search of the dark room, which had by this time been cleaned out. Our conclusion was that the foreign body had been lost in the secretions, sponges, towels or sheets.

Comment. Here we had a case of the same kind of foreign body, in the same position, in the same bronchus, in the same kind of patient (an adult male); we had the same circumstances of previous unsuccessful attempts by other bronchoscopists, and we had about the same length of sojourn of the foreign body, as in the previously published case which I then thought was outside the limitations of bronchoscopy. The case demonstrates, I think, that the upper-lobe bronchus is now not beyond the limits of bronchoscopy and that the upper-lobe bronchus problem has been solved. This case seems to parallel the failure of the earlier day as closely as is possible in clinical surgery.

Case No. Fdby. 831. Female child aged over two years. About a month prior to admission the child while running with a box of needles held to her mouth aspirated one of them. A choking attack occurred at the time of the accident, but there were no subsequent symptoms. An unsuccessful bronchoscopy of 55 minutes duration, was done under ether in a distant city. The bronchoscopist reported he could not find the needle. He did a second bronchoscopy four days later, using the fluroscope, in which he could see the needle though he could not grasp it. Severe dyspnea from subglottic edema followed this second bronchoscopy, probably because of the shortness of the interval between the two bronchoscopies. The edema subsided, however, without tracheotomy and the child arrived at the Bronchoscopic Clinic in good condition, without any symptoms except slight cough.

Physical Examination of the chest by Dr. William H. Spencer: Expansion somewhat limited over the lower right lobe. Percussion

moderately impaired over the upper right lobe. There is slight impairment also over the middle lobe. Over the lower right lobe posteriorly the percussion note is of greater dullness than is expected from the liver in that area. Breath sounds heard clearly throughout the chest. No apparent alteration in character except over the lower right lobe posteriorly where there are snapping rales on deep inspiration. *Inferences:* No obstruction to any bronchus. Pathology in the posterior portion of the lower right lobe.

Roentgen-ray report by Dr. Willis F. Manges: "A sewing machine needle in the posterior branch of the lower lobe bronchus, point is upward and inward, and forward. Fully half the needle is below

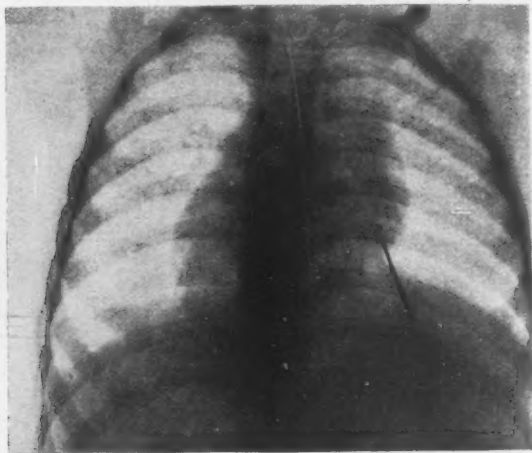


Fig. 2. Roentgenogram showing needle deep in the lung of a child aged two and one-half years. The needle had entered a tiny bronchus, the orifice of which was out of sight. Removed by peroral bronchoscopy without anesthesia, general or local. Immediate recovery.

the level of the dome of the right diaphragm. The lower end of the needle is within one-half to three-quarters inch of the posterior chest wall."

Bronchoscopy without anesthesia, general or local. All visible bronchi were found to be normal. With the aid of Dr. Willis F. Manges at the screen the needle was located in a small posterior branch of the inferior-lobe bronchus. The invaded bronchus was so small that only the smallest of the author's mosquito forceps could be insinuated into it. With this forceps the needle was seized as close to the buried point as possible, the point was turned out

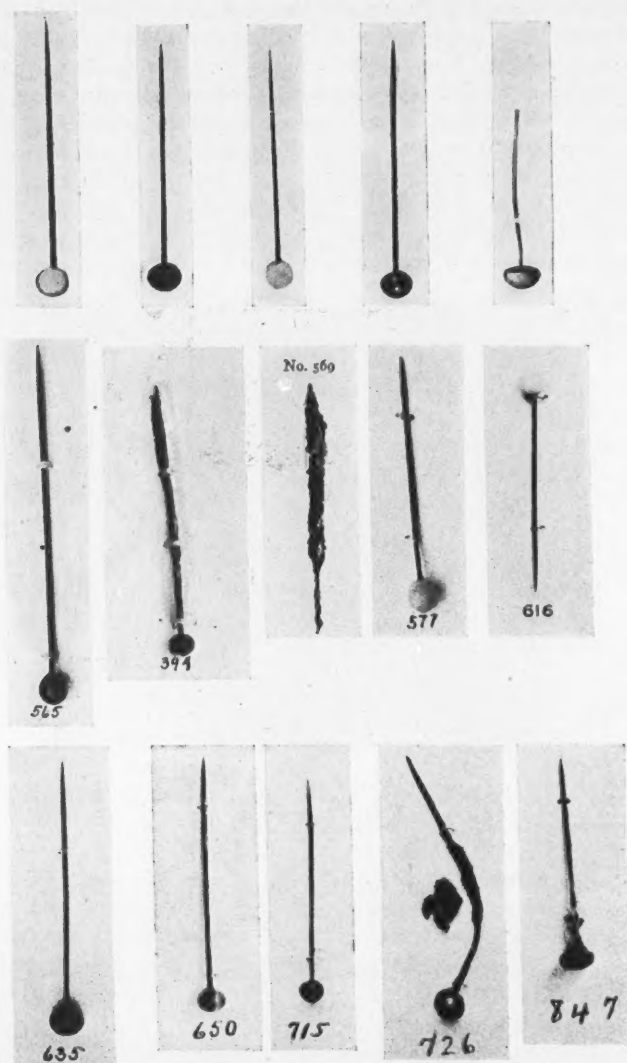


Fig. 3. Shawl pins removed from the lungs of patients at the Broncho-
scopic Clinic.

into the axis of the bronchus and withdrawn through the laryngoscope. Duration of bronchoscopy, 5 minutes.

This case presented, I think, all of the difficulties of the case of the 16-months-old baby with the pin reported by me as a failure in 1914. The lodgment in a tiny bronchus even the orifice of which could not be exposed presented vastly greater difficulties than the mere inability to insert the bronchoscope into the invaded bronchus. The difficulty of finding the invaded bronchus, the extreme difficulty of grasping such an object under such circumstances and of freeing its point were presented in even greater degree by this case than by the one in which I failed in the earlier days of the work. The surmounting of all of these difficulties in a bronchoscopy of only five minutes duration, and without anesthesia illustrates, I think, the point I wish to make, that there are no fixed limitations to the constantly developing science of bronchoscopy. The limitations of the past are not those of today; the limitations of today will not be those of the future.

Of the failure of the shawl pin it need only be said that we have removed fifteen of them. (Fig. 3.) Of this number, six were deeper, in smaller bronchi, much nearer the periphery, and presented greater difficulties in finding than were presented by the early case. In one case a shawl pin very deep down in the lung, after a sojourn of 28 years, was removed by peroral bronchoscopy in 3 minutes and 25 seconds. There was no mortality in any of the shawl pin cases and all made a prompt and complete recovery.

In the case of the bar-pin reported by me as a failure in 1914,* I do not know precisely what were the then insurmountable difficulties encountered by my predecessors in the case; but I understood them to be in the disentanglement of the foreign body. By the time the case reached me the pin had presumably entered a small bronchus the orifice of which could not be identified either by me or by one of the most experienced bronchoscopists of the day, who made a search immediately subsequent to mine. As one of my predecessors in the case was the discoverer of the feasibility of bronchoscopy, and as in all there were four of us who failed, the case may be said to have marked very definitely the limitations of bronchoscopy in its then embryonic stage of development (1907). The hundreds of cases of vastly greater difficulty in which the foreign body has been easily and quickly removed illustrate the progress bronchoscopic technic has made.

*Peroral Endoscopy and Laryngeal Surgery, Text-book, 1914.

As to the disentanglement of shawl pins, the author has published* a case illustrating one of the successful methods of solving the mechanical problem. The problem of finding a foreign body deep down in the lung may be illustrated by the following case in which the foreign body was below the level of the dome of the diaphragm and presented also the vastly greater difficulty of finding a foreign body below a tissue barrier.

Case No. Fdby. 659. Boy, aged 8 years. When two and one-half years old, while seated at the dinner table, the child spat up a mouthful of blood. An attack of bronchopneumonia lasting one week

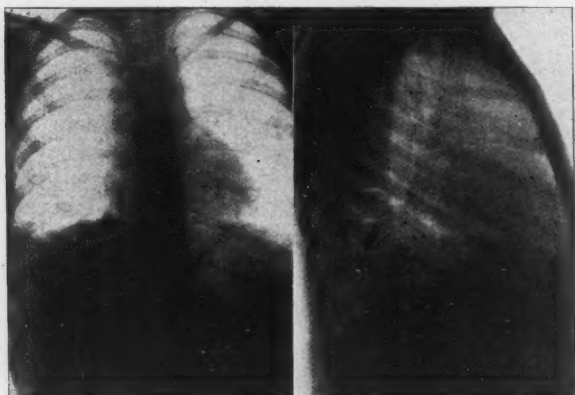


Fig. 4. Roentgenogram showing a metallic foreign body deep in the lung of a boy aged 8 years. Considering the depth of the foreign body, in the liver shadow below the level of the top of the dome of the diaphragm, and the superjacent tissue barrier that had to be circumvented, the successful peroral bronchoscopic removal without anesthesia indicates that there are no fixed limitations to the peroral bronchoscopic removal of foreign bodies from the lung.

followed, terminating in a chronic illness characterized by cough, purulent expectoration and hemoptysis. After about two years the hemoptysis ceased, but the cough continued and at intervals there was profuse purulent expectoration. The temperature was not noticed to be characteristically septic. Repeated sputum examinations were negative for tubercle bacilli. The diagnoses had been at various times bronchopneumonia, purulent bronchitis, bronchiectasis, and tuberculosis. The father, a physician, took the child for roentgen-

*A New Method of Working Out Difficult Mechanical Problems of Bronchoscopic Foreign-Body Extraction. *The Laryngoscope*, Vol. XXVII, Oct., 1917, p. 725.

ray examination, which revealed a foreign body very low in the right lung. Two bronchoscopies done by a very able man about a year before admission were failures.

Examination. On admission to the Bronchoscopic Clinic the boy was found under-developed, fairly well nourished, color good. Terminal phalanges of fingers and toes moderately enlarged (clubbed).

Physical examination of chest by Dr. Thomas McGrae: Less expansion lower right. Vocal fremitus little changed. Dullness at lower part practically going all round—in with about $1\frac{1}{2}$ inches (due to diaphragm not moving as much as normal?). Above this there is a definite area of hyperresonance, almost tympanic, in the axilla. On auscultation breath sounds are decreased at lower part over area of tympany; slightly more blowing than normal, but the change is slight. No rales. No signs of cavity.

Roentgen-ray report by Dr. Arthur Sender: There is a foreign body in the base of the right lung. It lies approximately one inch from the spine to the right and somewhat less than one inch in front of the tenth rib. In the plates made with the patient lying on the back, the inferior (also posterior) extremity of the foreign body lies below the level of the top of the diaphragm. In the fluoroscope the diaphragm shadow may be seen to rise so as to completely cover the foreign body shadow and to fall so as to completely clear it. The foreign body is slightly less than three-fourths of an inch in length and about one-fourth of an inch in diameter at its upper, larger and blunt extremity. From this it tapers to a rounded point. I have a suspicion that it is the steel tip which fits into a tubular umbrella stem. There is strikingly little pathology to be seen. Just a slight increase in density around the foreign body.

Bronchoscopy without anesthesia, general or local. Connective tissue barrier at bottom of fistula. Small fistulae leading off laterally away from the direction of the foreign body. Connective tissue removed with biting forceps. Wound dilated so that forceps could seize the foreign body, which was then seized with side-curved forceps and removed. Pus very foul after connective tissue barrier was removed. No true cavity found. Time required: 11 minutes, 48 seconds.

Comment. During the nearly 6 years sojourn of the foreign body in the lung, it had worked its way by pathologic process from the orifice of the main bronchus to the bottom of the lung.

CONCLUSIONS.

1. There are no fixed limitations to the peroral bronchoscopic removal of foreign bodies that have gone down into the lungs through the natural passages.

2. Projectiles that have gone in through the chest wall may be too large to be brought up through the natural channels;* but any localizable foreign body of appreciable size that has gone down through these channels can be brought back the same way; quickly at the first bronchoscopy in easy cases; at subsequent bronchoscopies in the difficult cases.

3. If mortality be avoided patient, concentrated work with rubber tube manikin, dog and cadaver will eventually solve any problem of bronchoscopic removal of any localizable foreign body of appreciable size. Obviously a small piece of pneumoconiotic material or a very small fragment of peanut kernel, for instance, may get into a tiny branch bronchus and therefore may not be localizable.

4. The bronchoscopic failures of ten years ago are no criterion of the peroral bronchoscopy of today. At that time the aeroplane would not leave the ground; now it flies over the mountains and the oceans. Bronchoscopy in its small way has advanced relatively as much.

*This statement was made on theoretical grounds. Since it was written the author has demonstrated that penetrating projectiles that have entered through the chest wall can be removed through the mouth by bronchoscopy. He thus removed under local anesthesia, a bullet that had entered between the seventh and eighth ribs posteriorly and had lodged in lung-tissue, not in a bronchus.

SUSPENSION LARYNGOSCOPY AND ITS PROBLEMS.

DR. R. C. LYNCH, New Orleans.

In view of the unusual conditions under which this manuscript is to appear, on the occasion of the twenty-fifth birthday of THE LARYNGOSCOPE, one might be excused for repeating some of the ground work which has led up to the present standardization of suspension laryngoscopy.

Since the subject is less than half as old as this most worthy American publication, it might not be amiss to condense under one heading the subject-matter as we view it today, that it may be an earmark from which to date the changes, improvements and differences in conception and execution, which may prevail hereafter.

I will ask your permission to discuss the technique as I have used it for the past four years, and which has undergone but little change in that time. During this period I have suspended many individuals of all ages, for as varied conditions and, differing in their physical characteristics, as only hundreds of non-selected individuals can. To these the same technique has been universally employed and with the greatest percentage of success; in fact, in the last four years it has not been my misfortune to fail of accomplishment in a single instance; this, of course, is due to the broadening of experience, the standardization of instruments and the application of a standard technique.

During the early period of my work with suspension, in the groping days, as it were, I changed from one plan to another even on the same individual, and as the accidents either occurred or were anticipated, changes were made here and there to counteract or prevent their possible recurrence or occurrence.

It is a pleasure now in recounting the experiences since the standardization of the present technique that no accidents whatever have occurred to the patient which could be blamed either to the technique or the instruments. I feel, therefore, that now I can speak finally at least on this subject so long as the instrument in its present form continues to be the one of choice for this class of work.

The hook and spatula as at present manufactured by the reliable firms of this country are strong and rigid and well made, and sufficiently close to the original design as to be standard.

The patient is prepared as for other surgical procedures requiring a general anesthetic, and on the table is covered with a sterile sheet; two pillow cases are slipped under the head, the one nearest the table furnishing a sterile surface for the head of the table, the other being used to wrap the head in such a manner as to cover the ears and eyes, leaving the excess of the case to hang over the head of the table. Covering the ears prevents the possibility of dropping infective tissue or secretions into the concha and finally into the external auditory canal. Covering the eyes not only protects them against injury such as has been mentioned above, but also protects them against injury from instruments being used in the operative work upon the suspended patient. The crane can also be covered with a pillow case and if this is tied at the angle between its horizontal and vertical portions will keep the covering out of the way and be a protection against contamination from this source.

In the matter of anesthesia I am still using the ether vapor, but of late (two years) have found the gas oxygen ether, sequence and combination, such as is delivered by one of the machines on the market for this purpose, has lessened the amount of ether very decidedly that the patient must inhale, reduces the shock from the anesthetic and is, except in unusual, robust, resistant cases, the anesthetic of choice. A patient weighing 180 pounds, of ordinary muscular development, can be maintained in perfect quiet, completely relaxed anesthesia with a mixture of 60 per cent ether, 25 per cent nitrous oxide and 15 per cent oxygen; these percentages are, of course, relative, but express as near as possible the relative proportion of the elements entering into the anesthetic mixture.

It is to be remembered that not only is the patient to be anesthetized to the point of quiet, but on the contrary, the anesthesia must be carried probably deeper into the surgical stage than for any other surgical operation with which I am acquainted—gall bladder, rectal and orthopedic procedures not excepted. For this reason then should this important part of the technique be in skilled hands. I have found it necessary to specially train my anesthetist for this class of work, so as to combine safety with perfect relaxation. May I mention here that I am thoroughly opposed to the administration of morphin, codein or scopolamin with or without atropin as a preliminary to anesthesia in these cases.

The morphin and atropin interferes with the principal guide to the depth of the anesthesia and may cause the anesthetist to push the anesthetic beyond the limit of safety; at least, the drug throws over the pupil a mask which excludes it as one of the indications of the depth of the anesthesia. The most important factor, however, is the effect of the morphin on respiration, both during deep anesthesia and especially where one is working on the breathway, the patient under morphin will invariably stop breathing, become cyanotic and it seems in most of the cases in which we have tried this combination, will give trouble. In two cases it was necessary to do tracheotomies in order to restore respiration, even though the breathway was apparently open. I know from my experience that the combination of morphin, atropin and the deep anesthesia required for suspension is bad and I caution you against it.

I cannot understand why some persist in the use of chloroform for this class of work when the warm ether vapor as delivered through one of the positive pressure machines of today is so much safer, giving a much wider range of anesthesia and is so decidedly less toxic. It is to be remembered that the continuous, smooth, even anesthesia is that to be most desired in contradistinction to any method which provides intermissions during which the patient wakes up and for which he must be crowded under again, not only interfering with the work in hand, but adding greatly to the dangers of anesthesia—nor have I thus far seen any pulmonary complications follow an anesthetic administered by the positive pressure apparatus. (I cannot see why one can blame the apparatus for the occurrence of either infarct or abscess.)

In my own work we start our patient with gas—add oxygen after the first few inhalations and continue until the pupil is fixed, then add ether until all cough, swallowing and pharyngeal reflexes are gone. In this stage of quiet, even respiration with a pupil that is beginning to dilate slowly, we have a stage of complete relaxation of the patient and plenty of latitude for safety; this is maintained by delivering the mixture through a mouthpiece and then it will be necessary to increase the percentage of ether to maintain this stage with the mouth open. If the case is to be long, we have found it very satisfactory to gradually discontinue the gas and maintain the anesthetic with oxygen and ether alone. In the cases of resistant, robust men, as a rule it has been necessary to switch to the positive pressure

apparatus, warming the ether and warming the vapor so as to increase the concentration sufficiently to produce perfect relaxation. I mention this detail because I have so often found it necessary to coach the anesthetist during the operative work.

I am using local anesthesia more often now than I did earlier in my experience, partly because I am able to acquire a view with the least amount of tension and secondly, because thus far with the method employed I am able to secure a very good, comfortable anesthesia and without any toxic symptoms, though as you will see there is no particular reason for the latter.

Thin long necks with poor muscular development and a temperament that is not only quiet, but willing to co-operate and probably possessed of a certain amount of stoicism represents the best selection for local work. As a class, and fortunately too, tubercular patients seem to possess the greatest number of these qualifications and almost universally lend themselves kindly to this procedure, under local anesthesia.

The uvula and post pharyngeal wall are painted with a 20 per cent solution of cocain; after a wait of one to two minutes, five drops of this 20 per cent solution is dropped over the epiglottis, and this is coughed out under instruction and wait for two minutes. Then a cotton-tipped applicator soaked in 1/1000 adrenalin is saturated with cocain crystals as one uses in the submucous technique; this is applied to the base of the tongue, pyriform sinuses on both sides as thoroughly as will be permitted; usually, a second application is made to this same region with the same solution, paste or mud, as it is variously called, and finally two drops of the 20 per cent solution are dropped onto the cords to be sure there is little sensation left in this region. I am certain that you will find ample opportunity to criticize this technique in its various parts, but so far I have not had one instance wherein there was even an alarming symptom. Most of the patients have the sense of well-being, some seem somewhat elated and several have felt rather tired and a trifle limp for one or two days following, but as far as actual toxic symptoms, either at the time or delayed later, I have yet to see the first case. Nerve blocking nor infiltration will suffice here to give that anesthesia which renders the procedure reasonably comfortable.

There is no objection, however, under local anesthesia to a preliminary morphin, atropin or scopolamin administration; in fact, I think in the majority it is comfortably borne, though in

some it will undoubtedly induce an early nausea and vomiting which will seriously interfere with the progress of the work. A careful inquiry into the patient's behavior under the influence of these drugs may give one the desired clue as whether it is best to be administered or not.

Having the patient properly prepared, wrapped and anesthetized, I proceed as follows: Instead of the dental spoons and long tooth plates spoken of previously, I have simplified this by using only a small piece of lead plate about two millimeters thick, sufficiently long to extend to the first bicuspid on either side, bent so as to protect the biting edge of the teeth and sufficiently wide to extend on the lingual aspect of the teeth sufficiently far so that the tips of the tooth plates will not make pressure upon the membrane. The tooth plates are the short type presented with the instrument as exhibited in 1915. Any ordinary table can now be used, as it is hardly ever necessary to elevate the table for a proper view, and one can make some arrangement by which the crane can be securely fixed to the table top so that it will be safe, rigid and easily movable into its various positions.

The head resting upon the table (it has not been necessary to drop the head over the table top in the last four years) is held in rather extreme extension by the assistant standing on the right of the table facing the head, placing both hands over the forehead and pulling the head back in such manner as to bring the occiput nearer the nape of the neck and raising the chin to its highest level.

The mouth is opened wide and held so by a gag which will fit into one angle of the jaw so as to be out of the way. In men especially of short rigid necks with marked muscular development where it will be unusually hard to see the anterior commissure, I have no hesitation in producing a sub-luxation of the lower jaw by opening the gag wide and lifting at the same time, making pressure upward on the jaw. I have done this so many times and without any untoward results that what I mentioned three years ago with fear and trembling, I can now say with full assurance that there will come no harm from this; moreover, it will offer about one-fourth inch more of the cords to view and facilitate the suspension.

I usually hold the hook in the right hand and with the mouth gag of the hook closed, pass the spatula down along the dorsum of the tongue for these two reasons:

1st. The rough convex surface of the spatula will cause the tongue to be pushed into the mouth and thus present its being pinched by the teeth of the lower jaw.

2nd. The tip of the spatula can be guided in such manner as to prevent injury of the posterior wall of the pharynx; when the hypo-pharynx comes into view the tip of the spatula can be used to lift the tongue and see the epiglottis, and when this point is reached I find it easier to actually place the tip of the spatula under the laryngeal face of the epiglottis than by the old method of following along the post pharyngeal wall. When the tip of the spatula has reached the laryngeal face of the epiglottis, if the proper length spatula has been selected, the tooth plates should be ready to drop behind the teeth of the upper jaw. If all is in the middle line, the tongue should be in the center of the mouth and not in contact with the lower teeth.

It may be best now to change hands, holding the hook in the left hand, and turning the screw, which opens the mouth gag of the hook, with the right hand. As the mouth gag opens, if the operator now sits upon a stool, by lifting the handle of the hook, or drawing it toward the head of the table or towards the operator, the larynx will frequently come into view. When the gag is opened to the full width through which it is intended to operate the handle of the hook is placed upon the crane, and by gently elevating the crane and moving it gradually toward the head of the table, a beautiful view of the entire hypo-pharynx, mouth of esophagus and interior of the larynx can be seen.

The assistant will now release the head, as the crane will maintain the position and serve its purpose. The mouth gag used to open the mouth is removed and it will most often be found that the head, instead of swinging free of the table or actually being suspended, is resting firmly on the table, which means the tension is greatly reduced.

The relative position of the crane to head is somewhat different now to that which was at first employed; usually the crane will move from one-third to one-half its distance toward the head of the table, and will usually be found to be about on a level with the ear of the patient. Therefore, no extension of the table top is needed.

If you will remember now that lifting the crane vertically flattens or straightens the road to the larynx, and that moving the crane horizontally toward the head of the table brings the anterior commissure into view, and turning the screw of the

pear-shaped ring drives the tongue spatula deeper into the mouth, and turning the worm gear joint on the handle of the hook, making its angle more acute, not only lifts the spatula, but elevates its tip, you will be in possession of all of the details necessary to acquire a proper working view of the larynx.

Sometimes the epiglottis will slip from under the tip of the spatula; this is especially so in children. The spatula may be too short,—it can be lengthened by turning the screw of the pear-shape ring or a longer spatula can be employed. Occasionally the epiglottis will be kinked or folded in front of the spatula so that its free edge will be crowded down into the cavity of the glottis; this, by the way, will not only seriously interfere with the view, but it will also seriously disturb respiration. To correct, one must take the hook off the crane, close the mouth gag and tilt the handle of the hook toward the foot of the table, thus relieving all pressure of the tip of the spatula from the epiglottis, which will return to its normal position. The gag is reopened and the handle tilted toward the head of the table and this difficulty overcome.

Probably the greatest trouble, especially with beginners, is to keep the tongue in the middle line; this is troublesome to me at times, but I have found that, if so, I proceed as I did with the epiglottis, close the gag and tilt the handle toward the foot of the table and in addition take the pear-shaped ring and with it move the spatula from side to side until I force the tongue into the middle line. When this is accomplished the gag is reopened rapidly, which holds the tongue in the desired position.

Catching the tongue between the teeth with the spatula so that the teeth of the lower jaw cut into or bruise the tongue will occur now and then, but this can be corrected by flexing the head slightly to allow the tongue to drop back into the mouth a little, and it is usually necessary to reintroduce the spatula with a view of avoiding this. It is time well spent for the comfort of the patient.

Suspension up to considerable tension should not be continued when the tongue is not in the middle line, as this will invariably result in either tearing the anterior pillar of the tonsil from tension or there will be produced a submucous hemorrhage. While these are not serious to life, they detract from the comfort of the procedure and add to the discomfort of the convalescence. Fracture of the teeth, either transverse or vertical or of the alveolus, does not occur any longer since adopt-

ing the position of the head resting on the table, relieving practically all of the tension and pressure upon the upper teeth. Therefore, all of the earlier contrivances devised to avoid these accidents have been discarded.

I have never seen, so far, an edema of the epiglottis or of the glottis itself from the use of the suspension apparatus, and do not believe this complication arises.

It will occasionally happen that the spatula selected is too long and during its introduction will pass down behind the larynx to come in contact with the esophageal face of the cricoid cartilage; when now elevation is made by the crane or the handle of the hook is pulled toward the operator, the patient will stop breathing. One is closing the larynx very tightly by this manipulation and I caution you especially against it, for if your patient is well under the anesthetic, it may so interfere with the rhythm of respiration as to cause the patient to stop entirely. Remove the spatula and either reintroduce it more carefully or use a shorter spatula. Sometimes the tip edge of the spatula will catch up the mucous membrane over the arytenoid cartilage and choke off respiration, and also interfere with the view. This can usually be corrected by moving the larynx laterally with the thumb and finger externally over the cartilaginous box.

It has been said that a patient could not vomit under suspension. This, as you know, is not so, and you must remember that this fluid will fill the nasopharynx and in suspension the Eustachian tubes are at their lowest level. They should be constantly protected from being contaminated by such secretion with the free use of a well-acting, fairly strong suction apparatus. Finally before the patient is taken down or the hook removed, the mouth and nasopharynx must be thoroughly emptied of all accumulated secretion, for if not done, this thick, ropy fluid will fall down into the larynx and produce a most distressing dyspnea and may do serious harm, not only at the time, but later in the progress of the case. After the hook is removed from the mouth, a gag should be kept in and any secretion removed from the mouth until the pharyngeal reflexes return, when the patient, even though not awake, will take care of it. It seems almost needless to mention that a well acting suction apparatus should be always at hand to care for any secretion which has to be removed. Gauze or cotton on holders have no room here and it would seem as though the

suction is as important an element in the operation as the crane hook or anesthesia.

In a discussion of the intra laryngeal surgery as practised under suspension laryngoscopy, it would hardly seem necessary to discuss either the technique or the indications, as they have been dwelt upon and described rather fully. I would like to mention certain instances wherein suspension is serving me to an advantage which I have not mentioned previously.

First, as an assistant in performing laryngectomy for carcinoma. If the patient is suspended at the beginning of the operation, the position in which the head is held is perfectly ideal for the work on the larynx and trachea. Since these structures are all on the stretch and held rigid so that the dissection can proceed much more rapidly to the point of separating the trachea from the esophagus. Now with the mouth wide open and an assistant at the head of the table, all secretion and its accumulation can easily be withdrawn from the mouth by a suction apparatus.

When in the region of the esophagus, a stiff bougie can easily be introduced to locate the esophagus and twice lately I have put a small light on a carrier down into the esophagus and had a wonderful view of this structure by transillumination. It is almost uncanny to see the thick and thin portions as they show up by this means, even though the room be light. Finally, when it comes time to take the larynx out, especially if you are working from below upward, with your assistant looking into the open mouth the hypo pharynx will show up and it is wonderful how one can orientate himself this way; then too, when suturing the anterior wall of the esophagus to the hypopharyngeal wall, it is easy to keep the line of suture straight and insure better approximation. The method has helped me so many times in so many of the little details that I cannot help but feel it is an addition of marked import to my technique.

I find suspension almost indispensable in the work on stenotic larynx and trachea cases. It not only permits of accurate dilatation, cauterization, incision of webs and all other manipulations within the larynx, but also when dilating from below upward, it seems to hold the parts well in view, so that we can be sure that no false passage is made and we can see every move. I always work now with my assistant with head mirror on; he will take the tracheotomy opening and I look into the mouth, and we direct each other just what to do and how its

manipulation is progressing. I sincerely recommend this to you for trial.

Suspension has helped me so much during the past year in the treatment of esophageal carcinoma with the radium needles, in which it was necessary to plant the needles either directly into the growth or just beneath the mass. I do not see how such manipulations can be conducted accurately, unless it be by suspension laryngoscopy. I must admit that the results of the radium treatment of the lesion are anything but satisfactory, only two cases out of nine show anything like progress and four of the nine are now dead. By the time another year is upon us, I fear the remaining five will share the same fate unless some marked change takes place. In two cases there seems to be some stay in progress and one of these looks slightly cheerful.

I am still very much in favor of suspension as an aid to bronchoscopy in infants and children as published in 1916. Time has made me more insistent on this technique and I feel it is thoroughly established.

For intrinsic carcinoma I would refer you to the transactions of the American Laryngological Society for 1920; benign tumors are yielding to the same technique as published previously. I am using fulguration and the actual cautery for the papilloma cases now. I am not ready yet to express myself as we are in the midst of some investigations which may help us in this condition.

It would seem a fitting close on this occasion to mention that I am now able to work within the upper half of the esophagus with both hands free, the realization of a dream of the past five years. I cannot at this moment show you the instruments or detail the technique until I am certain that it is an improvement over what we now possess. There still remain some details and problems to solve in this direction and until these are met and overcome, I hesitate to do more than mention the fact of suspension esophagoscopy.

SPECIAL FORMS OF HAY-FEVER AND THEIR DESENSITIZATION.

DR. WM. SCHEPPEGRELL, New Orleans.

True hay-fever is caused by the anaphalactic reaction to the protein of inhaled pollens. These pollens naturally vary with the geographical distribution of the plants which generate them, so that there are many kinds of pollen, not only in general but even in the same locality.

If all air-borne pollens were chemically and morphologically alike, so that hay-fever subjects would be equally sensitive to them there would be simply one form of hay-fever, differing only in degree according to the number of pollens inhaled, and the patient's degree of sensitization. This, however, is not the case. Taking for instance the grass and the ragweed pollens, the two most common causes of hay-fever in the Eastern states, 6 per cent of hay-fever subjects are sensitive to the pollen of the grasses, *Graminae*, and not to that of the ragweeds, *Ambrosiaca*, while 44 per cent are sensitive to the ragweeds and not to the grasses. This applies, in various degrees, to a large number of pollens that have been investigated in our laboratories and hay-fever clinic.

In view of this difference in the kinds of sensitization, there are various distinct forms of hay-fever that must be recognized and differentiated, if reliable immunological methods are to be instituted.

As there are hundreds of plants and trees that generate air-borne pollens, it is important to know which of these bear a sufficiently resemblance morphologically to be represented by the same immunizing agent. Unless such a plan were feasible, the application of immunological methods would be so extensive and complicated as to be a hopeless proposition.

In the case of spring hay-fever, the most common cause is the pollen of the *Graminae*, which besides the hundreds of true grasses, includes the cereals, such as rye, oats and corn. Fortunately, from the standpoint of hay-fever reactions, the biological resemblance in these pollens is so great, that one species may be used for the group, preferably the one that is most common in the patient's locality. As a rule, there are many grasses pollinating at the same time, but patients sensitive to one kind of grass pollen, are always sensitive to the others of this group, the reaction differing only in degree.

It must not be assumed, however, that all cases of spring hay-fever are due to grass pollens, or, if the patient reacts to these, that necessarily these alone are responsible. There are other pollens, as of certain trees, members of the *Chenopodiaceae* Group, such as the docks, *Rumex*, *Amaranthus*, *Amaranthus*, *chenopodium* and others, which may be a more or less important factor in the patient's attacks. Unless these are recognized, tested and if necessary included in the immunizing treatment, success becomes simply a matter of speculation.* The same rule applies to the fall hay-fever.

In order to institute dependable immunological methods in hay-fever, a botanical survey of the common anemophilous plants and trees should first be made of the surrounding territory, including a radius of 5 to 10 miles, as some of the more buoyant pollen, as that of the common ragweed, *Ambrosia elatior*, will traverse this distance in winds of sufficient velocity. Guided by this knowledge, atmospheric-pollen plates should be exposed with a view of determining what pollens are in the air at any particular time.

The patient should be tested only with the extracts of the pollens to which he is exposed, and the character and degree of the reaction noted. We record these on a decimal plan, using 100 for extreme sensitivity based on an experience of hundreds of cases. This record is an important factor in the question of dosage, as a high reaction requires caution in the administration of the pollen extract; and this record is, therefore, kept in view as a constant guide. It also forms the means of comparing the tests at various times, with a view of observing the progress of the case, and the question of repeating the treatment the following season.

The problem of pseudo-hay-fever, due to other than the protein of hay-fever pollens, should be recognized as a sole or accessory cause of the patient's symptoms. The protein of horse or dog dander, of feathers, etc., is an unusual but possible cause, and should be tested for, if the clinical history indicated such exposure. The immunizing treatment is not often indicated in these cases, as avoidance of exposure, except in those living on farms, is unusually all that is required.

Reaction to food protein should also be considered in cases where other tests are negative, or in which the symptoms persist after immunization has been effected to the pollens to which the patient reacted. In these cases, the combination of diet and immunological methods should afford relief.

*Wm. Scheppegrell, "Hay-fever and Asthma—Cause, Prevention and Treatment." 1921, Lea & Febiger, Philadelphia and New York.

OTO-LARYNGOLOGIC EDUCATION.

DR. D. J. GIBB WISHART, Toronto.

The subject of necessity divides itself into two distinct parts, which have no immediate bearing on each other, and are really absolutely separate, viz: The Undergraduate and the Post-Graduate.

The Under-Graduate.—This part of the subject is simple, if we accept certain axioms in medical education, such as that of Gradenigo, who states that, "What doctors need in their daily practice should be made compulsory."

The patient has a right to expect from the youngest tyro of the profession at least as careful an examination of his ears, nose and throat, as of his heart and lungs. The former parts are distinct entities in the body mechanism and "Where one member suffers, all the members suffer with it." The physician then must know how to examine the ears, nose and throat, and to detect variations from the normal if he would deal fairly with those who place their bodies in his care.

The limitations of the under-graduate course are, therefore, fairly clearly defined. There must be no attempt at, or thought of, specialism, about this section of the course, and possibly the course could be better taught by general practitioners than by specialists, as it is difficult to control the teaching, to avoid a desire to pose before the class, to talk for the sake of talking, to parade skill as an operator, etc.

In 1913, a committee representing the specialists of the continent issued a pronouncement¹ embodying their ideas as to how the course in oto-laryngology should be covered in the under-graduate teaching and laid down the following points:

1. That each student of medicine be entitled to receive sufficient instruction in oto-laryngology to enable him to deal with the parts concerned as intelligently as with the rest of the body.
2. That for this purpose he should be familiar with the anatomy of the parts, possess a practical working-knowledge of the simpler instruments of examination, be able to recognize familiarly the normal appearance of the structures, be practically acquainted with the picture presented by the acute inflammations and the commoner diseases of the organs involved, and how to treat the same. He should further be instructed to recognize

the symptoms of serious complications, the wisdom of early associating the greater knowledge of the specialist in the care of his patient and the dangers associated with all operations upon the parts involved, except in the hands of the competently trained specialist.

3. That for this "course of instruction" a share of each of the two final years of the medical curriculum be essential.

4. That the said "course of instruction" should embrace both clinical and didactic teaching, preferably intermingled, the clinical to be greatly in excess of the didactic, at least in the proportion of three to one.

5. That clinical instruction be given to small groups of students, preferably in classes of six, each receiving individual instruction, and this together with the didactic work should extend over a period of at least forty hours in the time of each student in each of the two years.

6. That operations should not form any part of the above course, except that insofar as may be possible each student should be permitted to assist at the performance of the simpler varieties, that he may become practically acquainted with the methods of procedure and the objects sought.

7. That a special separate examination in oto-laryngology, preferably clinical, conducted by the professor of oto-laryngology, form a part of the final examinations in medicine in every university, and every licensing body.

8. That a copy of these resolutions be forwarded to the medical faculty of every university and college of medicine, as well as to every state or provincial examining board, in the United States and Canada.

A perusal of the majority of the calendars of the class A colleges for 1920-1921 reveals the fact that a real endeavor has been made to follow the principles then laid down and a corresponding advance has been made in the education of the men now being graduated in medicine. In thirty-two out of the fifty-eight (calendars examined) of the sixty-one class A colleges, instruction is spread over the two final years; in one it is given in the three years; in six it is confined to the penultimate year, and in nineteen to the final year. In all cases there is a compulsory examination conducted by the teachers, who are all specialists.

In the discussion of the teaching of oto-laryngology to undergraduates before the American Laryngological, Rhinological and

Otological Society in 1911,² the late Dr. Holmes, and the editor of this journal, among others, advised that the student should assist in operations. The committee agreed with this to a slight degree, but personally I am now firmly convinced that the under-graduate should be barred from all contact with the operating room in oto-laryngology.

It is to be feared, however, that in some places there is ground for the statement (Report)³ that "There is a tendency in some of our best medical schools to permit more ambitious departments to over emphasize the work in their own specialty (i.e., oto-laryngology) for the under-graduate."

Shambaugh remarks that, "The present method of under-graduate instruction leads to specialism." If that be generally true the failure arises from a wrong conception of the principles laid down by the committee, or a departure from them.

The attention of the heads of oto-laryngology in the medical departments of our universities must again be called to the urgent need of limiting their staffs to the well defined object sought in under-graduate instruction, viz: knowledge of the anatomy, the normal appearance of the parts, the ordinary variations from the normal, and above all, absolute familiarity with the head mirror, the probe and the simpler instruments of examination. Beyond this the undergraduate course should not go. The student has no call to see operations, to make differential diagnosis, etc., his duty is to know when to summon special aid, and for this purpose be able to recognize "the beginnings of evil."

The real reason why our university teaching falls down is because the instruction, to be thorough, must be individual; the instructor must personally see to it that the student *sees* each nose or throat for himself and be convinced that each picture seen by the student is the correct one. Group teaching is largely impossible, except in anatomy and by way of introduction. Another problem is the difficulty of convincing the student of the necessity of constant practice upon his part in order to familiarize himself with the head mirror and probe.

If undergraduate teaching be limited along the lines laid down, it can never lead to specialization, or be reproached, as trespassing on the time required for medicine, surgery and midwifery in an overcrowded curriculum.

In this connection it is interesting to quote from the recent Inquiry into the Medical Curriculum by the Edinburgh Patho-

logical Club,⁴ where the following principles of the teaching of the specialty are laid down: "To acquaint the under-graduate with the relation which the organs bear to general disease"; "no finicky details, no elaborate descriptions of operations, no minute account of mere conditions; how can we expect more than the simplest essentials from our pupils?" "The importance of the inter-relationship of aural, nasal and laryngeal diseases with general medicine and surgery can hardly be over emphasized and the future practitioner should early be taught to take a broad view of such subjects and not to confine his diagnostic facts to the special region where symptoms appear."

The Post-Graduate.—In the second part of our theme—Post-graduate Education in Oto-Laryngology—we approach a subject that is giving rise to much thought and consideration, not only in America, but in the Old World.

In America it stands out as more urgent because, while the specialty originated across the ocean, it has on the new continent assumed the proportions of a hot house growth, and here one city alone may be found enjoying the doubtful privileges to be derived from a number of oto-laryngological specialists, so called, totalling not far from as many as there are to be found throughout the British Isles.

There are causes and explanations for this phenomenon. One of the main causes is undoubtedly the short course facilities provided by the post-graduate schools of New York, Chicago, and elsewhere, where until within the last few months there has been absolutely no check placed upon the time spent by the student in the study of his chosen specialty except that supplied by the length of his purse, and where no ideal was set before him as to what training was really needed to enable him to justly style himself a specialist. Anatomy, physiology and physics had long been left behind and none were required as an antecedent to instruction in oto-laryngology. As a rule the student was chiefly interested in operations. As an explanation we may adopt the words of the A. M. A. report:⁵ "Oto-laryngology has too long served as the catch basin for derelicts in general medicine, who have sought some dabbling knowledge in our specialty which will enable them to do some operative work of doubtful value to the patient, and too often on the basis of this, to renounce their general practice and become spurious oto-laryngologists."

To enable us to obtain as complete a bird's-eye view as possible of the question before us, I shall try to set forth briefly as accurate and upto-date a picture as I can of the conditions which prevail regarding the specialty in Britain, the countries of Europe and our North American Continent.

Britain.—As this article is in course of preparation, there fortunately appears in the *Journal of Laryngology and Otology*, an editorial⁶ which brings the situation up to date. We are informed that the Councils of the Sections of Laryngology and of Otology of the Royal Society of Medicine have memorialized the Royal Colleges of London with a view to the granting of a diploma in laryngology and otology by the Conjoint Board. This is the Board which deals with the qualifications of all candidates for the license of the Royal College of Physicians of London, and for the membership of the Royal College of Surgeons of England, two of the few registrable qualifications for Britain, whose examinations, moreover, are taken by a large number of post-graduates who come over from the Dominions.

If this request be granted, and as will be shown presently, there are precedents, the question will be solved for Britain at least and largely for the Empire.

The next step will assuredly be that, of all appointees to the staffs in oto-laryngology of the universities and hospitals, the diploma will be demanded as a guarantee of knowledge and standing. With such an example the public will quickly follow suit and thus without legislation the training of the specialist will be efficiently standardized.

Until this diploma is made possible there is no hall-mark available, however, although certain bodies have provided tests which are inefficient because they treat knowledge of laryngology and otology as a side issue. For example, the University of Aberdeen permits candidates for the higher degree (Ch.M.) to take oto-laryngology as their special subject. In Edinburgh, the Royal College of Surgeons, recognizes oto-laryngology as the special subject for a candidate in place of operative surgery. At the University of London, laryngology and otology are among the subjects which may be selected for examination for the master of surgery degree.

In all of the above instances it would appear that the candidate must pass also the papers in surgery set for the higher degree; in other words, he must prove himself as efficient on questions concerning the pelvic fascia, as in those of the eth-

moidal cells. There are no stipulations made, moreover, as to the character and extent of the previous training in oto-laryngology. Under such circumstances the above degrees are worthless from the specialist's point of view and impart no distinctive significance to their possessor.

Many of the universities and examining bodies have machinery ready to hand whereby the qualification could be made attractive and useful. For example, the Conjoint Board, referred to above, already grants a diploma in ophthalmic medicine and surgery and requires of each applicant a definite period of study upon a set curriculum. A diploma is granted by Cambridge University in medical radiology and electrology upon similar lines.

"With the establishment of a recognized diploma in laryngology and otology, a course of study would require to be defined and provision would have to be made for offering prospective candidates suitable facilities for obtaining the necessary instruction and clinical training. The period of study before the examination could be taken, the subjects which should be embraced, and the standards of knowledge that would be expected from the candidate would require to be carefully considered, and regulations laid down."⁷ It would add greatly to the attractiveness of this diploma if the conditions were made broad enough to allow of candidates trained in other countries seeking its franchise.

The necessity of providing reasonable post-graduate courses followed by examination and diploma or degree for workers in oto-laryngology has been repeatedly urged by the *Journal of Laryngology and Otology*, and by leaders in the specialty, notably Dr. P. Watson Williams, from whom I quote freely, and the present possibility of speedy solution is the result of this propaganda.

There are fewer professors at the head of clinics in oto-laryngology in Britain than in Germany, but there is a larger number of hospital clinics under the direction of competent specialists. "Excluding Ireland, and also hospitals where the work remains in the hands of general surgeons, I find that there are at least fifty-five British hospitals where, in all, seven hundred and thirteen beds are set apart for throat, nose and ear cases. This fact alone suffices to prove that, by a large consensus of professional opinion, laryngology and otology are now regarded as special departments, separable from medicine and surgery in the same sense as ophthalmology and gynaecology."⁸ Outside

of the University of St. Andrews, the National University of Ireland and the Conjoint Board of Ireland are the only corporations in Britain which make a definite clinical course obligatory for medical students and let specialists conduct the examinations. Edinburgh allows a choice between pediatrics and otolaryngology.

In arguing the case for the post-graduate training of the specialist, Watson Williams utters no uncertain sound upon the foundation which should be laid, and I may quote his own words, "Our kingdom cannot profitably be divided into medicine or surgery, for it is essential to the continued development of our own special branches on sound lines that they should be super-structures, broad based on the whole range of general medicine lest we exemplify the old Indian proverb, 'A surgeon who is no physician is like a bird with one wing.'" Those who specialize in laryngology and otology should have the advantage of a thorough acquaintance with the acquired anatomical facts and the physiology and pathology of the ear, nose and throat, including the relationship and bearing of other territories on these regions—for example, diseases of the nervous system and of the eye—with the history and development of operative measures, as well as wide clinical experience in the diagnosis and current methods of treatment of diseases of the ear, nose and throat, and when the practitioner has undergone the requisite course of special training he should have the opportunity of proving his efficiency."

It is further advised by this writer that at least two years is needful, "and possibly five years post-graduate work" before a special qualification is conferred.

Italy.—Our information in regard to Italy is derived from two sources, a special article by Prof. Massei, of Naples, in 1912,⁹ and a recent reference by Dr. Piero Giacosa.¹⁰

Teaching in otology was first provided in the University of Rome—and in laryngology in the University of Naples—both about forty years ago—by the establishment of special chairs, but in 1912, of the eighteen universities, only eight taught oto-laryngology, and of these eight, only one, Rome, had clinical wards. No attendance or examination was at that time compulsory in the undergraduate curriculum, but in the final examination the student was allowed to elect oto-laryngology, and if successful receive a certificate which, however, conveyed no special rights.

Giacosa advocates the adoption of measures, based on the

concrete proposals which have been put forward spontaneously in different countries to arrive at a common international standard in medicine.

Thus we see that oto-laryngology receives scant courtesy in the very land which has given birth to so many distinguished contributors to its advance as a subject of special study.

France.—The same remark may be made about France, where, according to Gelle,¹¹ out of the seven universities possessing medical faculties, not one in 1912 possessed a chair in oto-laryngology, although the eye and the skin were so honored. "French specialists," he says, "owe their education to gratuitous instruction, voluntary, not official. The specialist is self-created." The undergraduates, however, are required to pass an examination in laryngology under the professor of medicine, and in otology under the professor of external pathology.

There are some rays of light. "For development, after years of restraint, is at last taking place. In Bordeaux, Lyons, Nancy, there are well established and well equipped clinics, and courses of instruction have been installed. Further advance is opposed everywhere by financial considerations."

Since 1907, the French Oto-Rhino-Laryngological Society has required of those seeking membership, proof of study of these subjects at a special clinic for twelve months, and a further year spent in exclusive practice of the specialty.

In the group of countries of which *Germany* was the leading member, and possessed of the largest influence—Germany, Austria, Scandinavia, Holland, etc.—the specialty had by 1912, gained much greater recognition than in Italy or France.

Mygind¹² gives the following tabulated information for that year:

	Universities	Teachers
Germany	19	24
Austria	9	7
Scandinavia	5	5
Holland	5	4
Switzerland	5	3
Roumania	1	1

and makes the further statement, "The highest standard of the specialist is also to be found in Germany." Von Eicken,¹³ in his review of the subject in the same year says: "In Germany, as in most civilized European countries, our branch of medicine has

not yet attained to the position of independence which ophthalmology and psychiatry enjoy." "So far the only universities which possess professors are Berlin, Giessen, Halle and Rostock." "In some (five) universities properly constituted clinics do not exist."

The professional examination regulations since 1901 require a certificate from the student that he has attended a clinic for oto-rhino-laryngology regularly for six months, but the examination itself for the nose and throat is relegated to surgery and for otology to medicine, thus voiding to a large extent the value of the examination, and these regulations are not sufficient to ensure that every candidate for state license has to undergo an examination in oto-laryngology. Von Eicken does not believe that a change for the better can be expected until the examinations themselves are conducted by specialists in oto-laryngology.

There is no control over the assumption of the title of specialist in oto-laryngology, nor are any qualifications demanded of those who seek admission to membership in scientific societies.

Austria-Hungary.—Frey¹⁴ tells us that every student is required to attend a six weeks' course (70 hours) in oto-laryngology, but no examination is required for license.

Post-graduate work was started in Vienna and the university ear clinic, founded by Politzer in 1873, was the first ever founded in the world. There were six different courses on the ear for post-graduate students in Vienna before the war, and as a rule the classes contained not more than ten each. Frey, however, states his opinion that this class work is not sufficient education to make a fully competent specialist, and that the candidate needs in addition two years practical work in clinic or hospital under the close supervision of a high-class specialist. He takes strong ground against the conferring of a special degree by examination, because "examinations do not prove the real knowledge of the candidate." In Austria-Hungary, professors and directors of clinics or hospital departments are selected from among the privat-dozents. The title of "Dozent" is only conferred by the minister of public education, following a proposition by a board of professors, and given to *such only as have proved their capabilities during many years of clinical practice, and by a number of publications of original research work.* It is almost indispensable to be connected with a university, or to hold a leading position in a hospital, in order to attain full specialist rank in the eyes of the profession and the lay population. As in every

day life, titles such as "Professor," "Dozent," are always used when addressing a person, the general public is kept informed of the degree any doctor holds and in this way knows him to be a specialist of qualification. Thus a number of first-class specialists are created.

Denmark.—According to Hald,¹⁵ the medical student must attend instruction in oto-laryngology for forty-eight hours, but is not required to pass any examination. Any graduate may elect to practice as a specialist at his own sweet will, but as nearly all recognized specialists in oto-laryngology join the Danish Oto-Laryngological Society, where admission is obtained by a four-fifths majority in a secret ballot of the members, there is a control as to qualification. No special degree in nose and throat exists.

At the eightieth general meeting of the British Medical Association in 1912, a discussion took place upon the education of the specialist in oto-laryngology and in dealing with the continental aspect, Mygind,¹⁶ of Copenhagen, made the statement that the specialty was taught in nearly all the universities of Germany, Austria, Scandinavia, Holland, Switzerland and Roumania, but not at all in Russia, Greece or Portugal, and only partially in the other countries. In Germany, alone, there were in 1909, six hundred and two specialists in oto-laryngology.

In view of our present stage in the evolution of the specialty, it will be interesting to quote largely from Mygind's summary of the "Defects in the Continental Education and the Remedies therefor."

1st. The early training (undergraduate) must be held as most important. Superficiality in the examination of patients should be carefully guarded against. There must be little stress laid on lectures, and conversely much on practical work and detailed instruction.

2nd. Post-graduate courses however excellent do not represent sufficient education for a medical man who intends to settle down as a specialist.

3rd. The education received while acting as an assistant at a public special clinic must be based upon:

- a. An adequate preliminary education in surgery as a foundation stone. (Eighteen months' internship is suggested.)
- b. An appointment extending over a sufficiently long period. (Not less than one year.)

c. Sufficient time allowed for the examination and study of each case, under the personal control of the head of the clinic. (If the staff be salaried this control will be more efficient.)

His final conclusion is that the status of *privat-dozent* serves in Germany, Austria and Italy as an excellent means of raising the standard of the specialty, but elsewhere, failing this method, a compulsory diploma granted by a university or a special board should be demanded.

America.—We have at the moment two suggested plans for standardizing the study of the specialty:

First—Recommendations¹⁷ issued in 1920 by the Joint Committee, representing all the special societies in Oto-Laryngology in the United States and Canada.

1. (Preliminary.) The candidate must recognize that it is impossible to diagnose and treat a patient with an affection of the ear, nose or throat skilfully without a sound knowledge of general medicine, and to that end should either have practiced as a licensed practitioner for four years, or have acted as an interne in a class A general hospital for at least one year.

2. The candidate who possesses the above qualification should then proceed to prepare himself for the study of the specialty by pursuing, in the post-graduate department of a university, the following course of study, namely:—

- a. Anatomy of the head, neck and chest, embryology
and histology100 credit hours
- b. Pathology and bacteriology.....100 credit hours
- c. Operative work upon the cadaver.....100 credit hours
- d. Physics 32 credit hours
- e. Physiology30 credit hours
- f. Neurology20 credit hours
- g. Hygiene and public health..... 10 credit hours
- h. Reading of radiographic plates.
- i. Knowledge of the teeth, mouth and their diseases.
- j. General surgical technique.

All of the above, except the last, are to be considered from the viewpoint of their bearing on the oto-laryngologist, and the direction, as to the method by which this is to be arrived at, must be derived from the professor in charge of the department concerned in the university selected.

The above course should occupy the candidate from four to five hours daily for a period of six to nine months, and he is

advised to spend the remaining portion of each day in attendance upon an out patient clinic in oto-laryngology.

3. Subsequent to the completion of the above course, the candidate should secure a position as interne in a hospital especially devoted to diseases of the ear, nose and throat, or in a general hospital possessing an adequate oto-laryngological service. The period occupied in this portion of his training will vary, but should not be less than 16 months.

The candidate must recognize that the above course is only a minimum, and that if he desires to rank as a first-class specialist he must further pursue special study, either on this continent or abroad, in centers where opportunity is afforded to follow the work of those devoting their time to certain special fields in oto-laryngology.

The committee hope to be able to assist the candidate in the following ways:

1. Securing from the post-graduate departments of the universities a suitable degree, to be conferred only upon such candidates as have followed the above course.

2. By correspondence with the post-graduate departments of the universities with a view to securing a uniformity in the course of study to be pursued under the various heads of No. 2.

3. By arranging with the hospitals referred to above to limit their appointments as internes to those candidates possessing qualification as outlined under 1 and 2.

4. By preparing a list of hospitals to which candidates may safely be recommended to apply for the position of interne.

5. By securing reliable information as to the facilities offered by various centers which they may place at the disposal of those who desire to perfect themselves still further in any department in oto-laryngology, after the above course has been concluded.

Second—Recommendations¹⁸ of the Committee on Graduate Instruction of the American Medical Association.

SUMMARY.

"1. We recommend that students preparing for the practice of oto-laryngology be graduates of class A medical schools and have completed a year's service as interne in an approved general hospital.

"2. We recommend that when possible the preparation for special practice be started immediately after the completion of

this hospital year. We do not approve of specialization beginning during the undergraduate course.

"3. We recommend that the minimum training consist of eighteen months full time work, the first year to be spent in one place. The last six months may be continued here or the work may be pursued in other approved centers. The work pursued during the first year should include a half of each day devoted to the clinical study of cases, the other half day to the study of the fundamental sciences and to library work.

"4. All of this work must be done on the basis of genuine graduate instruction in which the student does his work individually under proper supervision.

"5. The work in the fundamental sciences should be done in properly equipped laboratories such as exist in all class A medical schools. The clinical work must be done in a properly equipped and properly organized out-patient department of either a class A medical school or a special hospital, the student serving as a clinical assistant.

"6. On the completion of the first year's fundamental training, the student is advised to secure as far as this is possible, the position of interne in a special hospital or of resident in otolaryngology in a general hospital.

"7. For those students who are not able to secure suitable hospital positions after the completion of the first year's fundamental training, the remaining six months' work necessary to fill out the eighteen months minimum requirement may be taken as continuation of the first year's work in the same institution or by taking special work in other centers. Others may devote the last six months serving as assistant in the practice of some established specialist. When the latter alternatives are followed the work must meet the approval of the institution in which the first year's work has been taken.

"8. We recommend that on the completion of the above requirements the student be granted a suitable certificate setting forth that he has had the proper preparation for taking up the practice of the specialty. This certificate is to be granted by the institution in which the first year's work has been done. We feel satisfied that such degrees will be granted as readily by the university to those students preparing for the practice of otolaryngology as to students in any other field whenever the work pursued meets the requirements established for the granting of such degree.

"9. We recommend the perfecting of existing post-graduate courses, clinics, etc., as review work for those established in special practice as well as for those who have completed the first year in fundamental training as outlined above."

At the time of writing a call has gone forth for a joint conference of these two committees, and it is possible that a common basis will be arrived at, which will be presented to the 1921 meetings of the American Medical Association and the various special societies.

Should these organizations, which are striving towards a common end, agree upon a basis, something at least will have been accomplished.

Before entering upon a discussion of the present situation, however, it will be interesting to review the steps leading up to the *status quo*.

J. N. Mackenzie¹⁹ states that when in 1893, the University of Johns Hopkins opened its doors to medicine, it was the first place of learning in America or overseas to give laryngology the prominence which its place in medical education demanded. This statement is ambiguous. There was a chair in ophthalmology, otology and laryngology created in Trinity Medical College, Toronto, in 1888, and prior to this a lectureship had existed for years. In McGill University, the chair was established in 1893.

Whatever the facts are as to priority in the establishment of chairs in this specialty, Mackenzie was able to state in 1901, that "The place of laryngology in university study has been grossly neglected in America and Europe. Even when it is indicated in the calendar it is a mere poetical abstraction, altogether baseless and impractical."

In 1907, Shambaugh²⁰ wrote an article upon the "Preparation of the Specialist," in which he took the ground that "The need of special training for the men entering a medical specialty is as urgent as the training of the physician for the work of general practice," and further stated that "The only places in which this work can properly be done are the universities and colleges, in which adequate facilities are afforded by well equipped laboratories."

In 1911, MacCuen Smith²¹ presented to the American Laryngological, Rhinological and Otological Society an extensive report, embracing a number of written opinions from professors in oto-laryngology in leading universities.

Following the ensuing discussion, a small committee was appointed to report upon "The best methods of teaching otolaryngology in undergraduate and post-graduate schools."

This report was forthcoming in 1913,²² and adopted insofar as it referred to undergraduate teaching, but the other associations of specialists were invited to unite in forming a joint committee to decide as to the post-graduate problem.

The suggestion met with a hearty response and in the following year a joint committee representing the American Laryngological, the American Otological, the Academy of Ophthalmology and Oto-Laryngology, the Section of Oto-Laryngology of the American Medical Association and the American Laryngological, Rhinological and Otological Society began its labors, only to be interrupted by the great war, so that its final report was not issued until 1920. This was at once published and forwarded to every university, as well as to the leading hospitals and medical journals of North America. The conclusions have already been stated.

Just as this report was published, however, the Council on Medical Education of the American Medical Association, recognizing the urgency of the general question of graduate study, appointed fifteen sub-committees, representing as many specialties (and among these one in oto-laryngology) to prepare reports for presentation to the 1921 session of the American Medical Association. The findings of this committee have been quoted in full above.

In the United States and Canada, every medical teaching body, classified by the American Medical Association in 1920 as class A acceptable medical colleges²³ and which are teaching the clinical branches, appears to possess a chair in this specialty. There are seventy-two mentioned in class A. Of these, eleven teach the primary subjects only, and of the remaining sixty-one, I have examined the calendars of fifty-eight.

In each of these there is one chair, and in several the specialty is divided between two chairs, otology and laryngology. It is also to be again remembered that all students are examined by specialists as a necessary preliminary to a degree.

There are several very important "sins of omission," however.

1st. An examination in oto-laryngology is seldom, if at all, demanded by boards which examine for license to practice. This

has no significance of importance, so long as the subject forms part of the examination for a degree.

2nd. There are few recognized degrees, or diplomas, which the would-be specialist can secure. It is true that an advanced degree, after a two years' course is granted by the University of Iowa, but the class is limited to two students. In the graduate school of the University of Pennsylvania, an eight months' course is required to obtain a certificate, and a longer term to obtain a diploma, and it would appear that master of medical science (oto-laryngology) may be obtainable. The classes are limited and the candidates are selected.

The University of Minnesota has an organized course of three years post-graduate work leading to a Ph.D. (Oto-Laryngology) with a limited number of paid fellowships. Apparently about five men can be accepted yearly.

These three comprise the only institutions of which we are aware in America, where degrees in the specialty can be obtained, and at the outside only about ten candidates can be turned out yearly, obviously a number far from sufficient to supply one hundred and twenty millions of population.

The American College of Surgeons, while admitting oto-laryngologists to its fellowship, has not yet laid down any definite qualifications other than those required from general surgeons, nor has it in contemplation any provision for a course of training in the specialty.

There are, however, other avenues of entrance which provide a modicum of training. A small number of hospitals, general and special, have offered a varying number of internships in oto-laryngology with a service of from twelve to twenty months. There is serious competition for these posts and the standard of entrance requirements is therefore rising. During the last quarter of a century, most of those who desired to enter the specialty seriously and to qualify for university and hospital appointments have sought these positions and have at the completion of their term of service taken further post-graduate work in Europe.

In New York, thanks to the energizing stimulus of the New York Association of Medical Education,²⁴ The Manhattan Eye, Ear and Throat Hospital, and The Post-Graduate Medical School, are from October, 1919, providing eight months courses in oto-laryngology, inclusive of anatomy, physiology, etc. Other

institutions, such as the New York Eye and Ear Infirmary, are, it is understood, expected to follow suit.

In Chicago, Detroit and elsewhere similar courses are, it is understood, being organized.

It is wise at this point to remind ourselves of the words of Sir Andrew Macphail,²⁵ "Medicine is the only profession that shows any concern for the further education of its graduates. Upon a given day the graduate may profess that he has acquired the mystery, but no one believes him. There is a great gulf fixed between knowing a thing and professing to know it, and a still wider gulf between knowing and the doing of it. Study of medicine must continue as long as life endures."

We have, we trust, placed before the reader sufficient data to enable him to estimate the exact position of the respective countries which have been foremost in advancing the cause of education, medical and otherwise. The cause is the same, in whatever language it may be expressed. The profession is eager in every land where modern medical science prevails to justify its existence to the public by elevating the standards of education. This review of the progress of one specialty in the first quarter of the twentieth century demonstrates that much has been done, and that much is being attempted.

It is needful that every member of the profession should possess himself of the knowledge herein assembled in order—that he may give wise counsel to those would-be students who apply for advice as to the wisest course in study—that he may influence his colleagues and the public, whether in university, hospital, municipal, business or private circle,—that he may prove himself to the limit of his advantages, a factor in the great task of making progress upward.

The value and the necessity of post-graduate study in the various branches of medicine is occupying the attention of many universities and medical bodies, and requires no demonstration here. Advance will be made, however, by the vis a tergo, and the public must be educated as well as the profession if there is to be a healthy reaction.

The universities must recognize that when six thousand applicants²⁶ demanded post-graduate work in America in 1920, they have a duty to their students which is not terminated by the conferring of a doctor's degree, and that post-graduate instruction is as important as undergraduate and must be provided for.

The public must recognize that nothing but the best in medical education under-and-post-graduate must be demanded and obtained.

Too much emphasis can hardly be laid upon the assertion that the stress of post-graduate teaching in oto-laryngology must be placed upon the taking of the case record, the examination of the patient, and upon the differential diagnosis. Hitherto it has been laid upon the operative technique and the ordinary courses of the post-graduate schools should be held responsible.

The post-graduate school has its place of usefulness, nevertheless, and that is upon the conclusion of a preparatory course in the basal sciences and examination of the patient, as indicated in the eighth recommendation of the A. M. A. report.

We are inclined to think that were one hundred trained men turned out yearly this would supply the seepage of the specialty. There are also quite a sufficient number of class A hospitals to provide internships for these men.

The statement that in America, "Opportunities by which graduate students may prepare themselves by long periods of work for scientific and skilful practice of clinical specialties are woefully lacking" is as true of oto-laryngology as of any other branch of medicine.

To sum up—For the United States and Canada we need means by which *specialists* may be labelled, to the public, to the universities and hospitals requiring to make appointment to their staffs, as reasonably trained, and to that end possessed of—

- a. Graduation from a class A university.
- b. Post-graduate year as a rotating house surgeon.
- c. Further satisfactory post-graduate education in medicine and surgery, and also in the anatomy, physiology, physics, etc., bearing on the specialty.
- d. Subsequent post-graduate study of the specialty for at least eighteen months, and inclusive of laboratory training. This may be obtained in various ways, but preferably as assistant in special clinics of standing, or as houseman in the oto-laryngological service of a general or special hospital.

Those universities which possess post-graduate departments might well aid in this matter by providing machinery whereby men and women who have obtained the above grade may be provided with a distinctive diploma or degree.

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N. B.—It is interesting to note that the Joint Meeting of the representatives of the A. M. A. and the Special Societies took place in Atlantic City on the 30th of May, and was attended by practically every delegate. The joint resolution prepared embraced most of the points brought forward in the two reports mentioned above, but did not provide, we believe, sufficiently for preliminary instruction in practical medicine or surgery. This resolution was adopted by three of the special societies and sent on to the A. M. A.

47 Grosvenor Street.

THE LARYNGOSCOPE TWENTY-FIVE YEARS AGO.

DR. M. D. LEDERMAN, New York.

A quarter of a century has passed since the young Lochinvar of the West had the temerity to appear upon the laryngological and otological horizon, to withstand the vicissitudes and trials which every newcomer in medical journalism must necessarily experience before reaching the anxiously sought for goal.

Handicapped somewhat at first by a name which did not appeal to some of our fastidious friends, THE LARYNGOSCOPE has weathered the storm, and is today accepted by its readers both here and across the seas as a valuable and progressive archive of current thought and contemporary work.

It was not a simple matter to select a comprehensive single word descriptive of the two specialties to which the journal was to be devoted, and as the "laryngoscope" had become an illuminating instrument for examination of diseases of the nose, throat and ear, this name was chosen to carry its message around the world.

We were indeed fortunate at the start to have such earnest and loyal workers as Frank M. Rumbold and M. A. Goldstein of St. Louis, S. Scott Bishop of Chicago, W. Scheppegrell of New Orleans, F. B. Eaton of San Jose, California, together with our foreign associates, J. Dundas Grant of England, Victor Urbantschitch of Austria, A. Hartman of Germany, J. J. Kirk Duncanson of Scotland, J. K. Kimura of Japan, C. Sterling Ryerson of Canada, Fred. Semeleder of Mexico, and Gottlieb Kaiër of Denmark.

It is not often that a monthly periodical in medicine is able to start off on its career with a subscription list of three hundred prominent members of the profession, in advance of its first issue, but such support indicated that there was a place for a worthy American monthly journal in the domain of laryngology and otology, and the earnest co-operation of many eminent devotees in this specialty has brought THE LARYNGOSCOPE to the dignified position which it now occupies. When we recall the unfortunate and untimely end of that splendid journal, the Archives of Laryngology—so ably edited in 1880 by George M. Lefferts and Elsberg of New York, J. Solis-Cohen of Philadelphia, and Knight of Boston—which enjoyed a brief existence of only four years, owing to a lack of proper recognition by those interested in this field of medicine, we cannot permit

this opportunity to pass without expressing our admiration for the present editor-in-chief, M. A. Goldstein of St. Louis, and for his determination and unceasing efforts to place before the profession a monthly journal which would command their respect and support.

In these days of rapid medical progress, when books become obsolete in a comparatively short time, the editorial staff deems it advisable to offer to the readers of *THE LARYNGOSCOPE*, the essence of practical experience of those engaged in treating diseases of the nose, throat, and ear, so that the journal may be an epitome of valuable information. It has been our constant aim to offer worthy material in a condensed form, so that unnecessary reading could be avoided and only vital matter be given prominence. In the first number, abstracts both domestic and foreign were selected, and this practice has been continued in each issue, thus attempting to offer the latest information that could be obtained by the associated staff, both here and abroad. Complete reports of special societies appeared in the pages of the early numbers, and soon *THE LARYNGOSCOPE* became the official organ of the American Rhinological, Laryngological and Otological Society. The American Academy of Ophthalmology and Oto-Laryngology (Oto-Laryng. Section), and published the monthly meetings of the Laryngological and Otological Sections of the New York Academy of Medicine, as well as the transactions of other special societies.

In these days of advanced diagnostic technique, it is interesting to recall that in the first number of *THE LARYNGOSCOPE*, published a quarter of a century ago, J. Mount Bleyer called attention to the photo-fluoroscope, an instrument that could photograph an object in the living tissues at a distance. The important advantage he claimed for the photo-fluoroscope over the Roentgen method of photography was that curves, corners, and angles were no obstacles to it; while an object in the Roentgen photograph must always be in direct contact on a flat plate containing the sensitized plate, with his instrument the object could be photographed at a distance. Dr. Bleyer published in this paper photo-fluoroscopic pictures of a larynx with an intubation tube in position; also of a lost intubation tube found in the trachea and removed by the aid of this valuable art. He further maintained that he was able to obtain distinct definitions of tumors, growths, foreign bodies, and various diseased conditions of the larynx, bones of the face, and accessory cavities, and the lungs. A description of his instrument and its method of application appeared with illustrations,—so that twenty-five years ago the idea of seeing by human device through many inches of solid matter was no longer a chimera.

In the February, 1896, number of THE LARYNGOSCOPE, J. Solis-Cohen of Philadelphia, reported a case of *laryngotomy (laryngo-fissure) without impairment of voice*, thus ending the dispute between surgeons and laryngologists that division of the thyroid cartilage permanently impaired the voice. His patient was a child 3 years of age, whose thyroid cartilage he divided in order to remove a sliver of turkey bone the size of an adult thumb nail, which had been partially incarcerated for six weeks in the right ventricle of the larynx. Recovery was prompt, and the voice became perfect in two months. With our present direct laryngoscopic examination and technique, corroborated by X-ray photography, so formidable an operation would not be necessary, for such foreign bodies can now be found without much loss of time.

Early in 1907, the publishing department of THE LARYNGOSCOPE had the pleasure of placing before the profession Chevalier Jackson's classic and authoritative volume on Tracheo-Bronchoscopy, Esophagoscopy, and Gastroscopy. Up to that time, the only information on these subjects in the English language was in the reports of cases published in various journals which did not give much aid for working data. In his finely illustrated book, Jackson described in clear and concise manner the technique of direct laryngoscopy, tracheo-bronchoscopy, and examination of the esophagus and stomach, and directed attention to the difficulties and dangers that are encountered in their application. This was the first practical study of the subject under consideration, and was mainly the result of his personal experience. The instruction that its pages offered did much to stimulate the employment of this valuable method of direct examination. Due credit was given to Professor Gustav Killian for his studies of the trachea and bronchi, and the volume was dedicated to "Killian, the Father of Bronchoscopy," as a token of esteem.

That direct inspection of the esophagus was not a recent discovery, is shown in Jackson's historical data. Bonzini, in 1807, examined the upper end of the esophagus; Voltolini and Waldenberg, in 1860; and Stoerck, in 1861, described esophageal specula, using the laryngeal mirror. In 1868, Kussmaul diagnosed a carcinoma of the thoracic esophagus, using a Desormeaux urethroscope 43 cm. long. The instrument was rigid, and he used the "sword swallowing" position.

In 1896, Mikulicz reported successful cases of tracheoscopy; and in 1897 Kirstein described tracheoscopy as well as his well known direct laryngoscopy. For the latter, he used at first a tubular spatula. Killian, in 1897, removed a foreign body from a bronchus and

demonstrated the feasibility of upper bronchoscopy. Later, he developed lower bronchoscopy. These were the greatest steps in endoscopy, which led up to the present day study of pulmonary suppuration by direct inspection and local medication.

We were fortunate to present to our readers in the first number of *THE LARYNGOSCOPE* an interesting and instructive paper by J. Dundas Grant, F.R.C.S. of London, on "The Clinical Investigation of Ear Disease." In his lucid manner, the author described the various steps in reaching a diagnosis, and gave in detail the numerous tests which were employed. Though written twenty-five years ago, this article could be read with much profit today. It was a pleasure to welcome Dr. Dundas Grant to our shores at the time of the International Otological Congress held at Boston in 1912, and to then renew the acquaintance made in London some years previously, when his cordial attention left a most pleasing impression of our visit to England.

In the December number of our first year (1896) there appeared a monograph by J. Mount Bleyer, F.R.A.M.S., entitled "An Essay On the Organs of Taste." This article was a companion to the one presented to the French Laryngological Society of Paris, in May, 1896, "Memoir On the Odoriferous Sense," by the same worker. In this interesting paper, the author described his method of investigation, which was of a painstaking nature, and after careful experiments he came to the conclusion that true impressions of taste could only exist when the glosso-pharyngeal nerves were intact. Many physiological data were given, and much investigation must have been required to collect the facts presented.

We merely mention these matters to remind our readers that the pages of *THE LARYNGOSCOPE* are always open to original thought on any subject associated with diseases of the upper air passages.

During the summer of 1919, we were honored by the presence of another of our British associates, Sir St. Clair Thomson, whose genial hospitality at the International Otological Congress in London in 1899 added so greatly to the enjoyment of our stay. His brilliant attainments and charm of manner made an indelible impression upon all who were privileged to meet him, and on his return home he left behind a host of admiring friends. Sir St. Clair's association with *THE LARYNGOSCOPE* dates back for more than twenty years, during which period he has been the European editor of this journal. He has been knighted by the King of England, and at present is the attending laryngologist and aurist to the royal family. Before closing these rather desultory reminiscences, the writer wishes to pay sincere homage to those of our colleagues who have passed to the

"Great Beyond." It has been his privilege to have been an associate of that skillful laryngologist, Joseph W. Gleitsmann, whose erudite contributions to the literature on diseases of the larynx and upper air passages were the result of an extensive and observant clinical experience. Under a somewhat rugged exterior, there existed a sensitive nature, which deeply appreciated the slightest personal thoughtfulness. We were associated for many years at the New York Polyclinic Medical School, and his diagnostic acumen and skillful technique in the surgical treatment of laryngeal diseases formed a great attraction to the student body. He was an authority on tubercular and malignant involvement of the larynx, and *THE LARYNGOSCOPE* had the pleasure of publishing a number of his original contributions. In his demise, the profession lost an earnest and energetic worker.

Among the number of well known and distinguished colleagues whose scientific contributions have advanced the knowledge of our specialty, but who are no longer with us, we recall the names of H. Holbrook Curtis, E. Fletcher Ingalls, William L. Ballenger, Edgar M. Holmes of Boston, and Christian R. Holmes of Cincinnati. When the latter realized that his end was not far off, his remarkable fortitude prompted him to dictate letters to the people of Cincinnati, to the Board of Trustees of the University of Cincinnati, and to the faculty of the Medical School, earnestly requesting them to continue the great work which he had started and to carry it through to a successful termination. In him the profession lost a profound scholar and a great man.

In this group of talented scientists who have been called to their final resting place and whose individuality has left an indelible impression upon the subject of laryngology, we recall with profound admiration and respect the names of George M. Lefferts, Gustav Killian, and Sir Felix Semon. By their skill and unceasing energy, Lefferts in America, Killian in Germany, and Sir Felix Semon in England did much to advance the prominence of laryngology, and their successful efforts have placed it among the important chapters in the domain of medicine. Semon's investigations in malignant disease of the throat, and his work on functions and diseases of the motor-nerves of the larynx are classic. Though born in Germany, where he received his medical degree, he visited Vienna and Paris, and finally settled in England, where he became a member of the Royal College of Physicians. He was one of the founders of the Laryngological Society of London and became its president

in 1894. At the Diamond Jubilee in 1897, he was knighted; and in 1902, he was decorated C.V.O., being advanced to K.C.V.O. in 1905. In 1901 he was appointed Physician Extraordinary to King Edward VII. During the World War he was loyal to his adopted country. In 1884, he founded the *Internationale Centralblatt für Laryngologie und Rhinologie* and he remained its editor for twenty-five years. Some years ago he visited this country, and was received with all the honor and attention which was due so great a scholar. A large number of distinguished laryngologists assembled to greet him at a reception and dinner, and in his modest manner he eloquently expressed his thanks and appreciation for the attention shown him. Sir Felix always had the strength of his convictions and the brilliancy of mind to support them. He was a lover of music and the arts, and counted among his friends many distinguished and cultured men and women of Europe.

To Gustav Killian the science of medicine owes much. His studies on the nasal sinuses and his contributions on upper and lower bronchoscopy were the incentive to our present knowledge in the treatment of nasal and pulmonary suppuration, and may yet prove to be the dominating influence in ridding the human race of the ravages of the great white plague.

During the past quarter of a century THE LARYNGOSCOPE has constantly aimed to offer to its readers the practical experience and scientific investigations of recognized authorities, and all those who had interesting observations to record in the realm of rhinology, laryngology and otology. We earnestly hope that the splendid support accorded this journal in the past years may continue uninterruptedly, and more firmly bind the good fellowship which exists among those who are friends of a worthy cause.

APPRECIATIONS.

We beg to acknowledge receipt of many congratulatory letters and messages, among which we take the liberty of publishing the following:
Philadelphia, June 3, 1921.

Dear Mr. Goldstein:

At the meeting of the American Laryngological Association, May 31, 1921, the following resolution was passed:

Resolved, That the American Laryngological Association congratulate Dr. Max A. Goldstein upon the coming Twenty-fifth Anniversary of THE LARYNGOSCOPE, and upon his long and able conduct of the journal.

With kind regard, believe me

Sincerely yours,

GEORGE M. COATES, Secretary,
American Laryngological Association.

At the fifty-fourth annual meeting of the American Otological Society, held in Atlantic City, the following motion was offered and unanimously adopted:

The American Otological Society in session assembled at its Fifty-fourth Annual Meeting extends to you its hearty congratulations and best wishes upon the completion of twenty-five years as founder and editor of THE LARYNGOSCOPE.

Philadelphia, June 22, 1921.

My dear Dr. Goldstein:

In behalf of the President and the Council of the American Academy of Ophthalmology and Oto-Laryngology, I extend to you felicitations and congratulations on having completed twenty-five years of most excellent service to your confreres as editor of THE LARYNGOSCOPE.

Trusting that your life may be preserved for many years to come, and that your facile pen may continue to contribute to American Medicine, I remain

Very truly yours,

LUTHER C. PETER, Secretary,
American Academy of Ophthalmology and Oto-Laryngology.

LUNCHEON AT THE HOTEL CHELSEA, ATLANTIC CITY, N. J., ON
THE TWENTY-FIFTH ANNIVERSARY OF THE LARYNGOSCOPE.

Members of the Editorial Staff present: Dr. Joseph C. Beck, Chicago;
Dr. Otto Glogau, New York; Dr. Thomas H. Halsted, Syracuse, N. Y.;
Dr. Harold M. Hays, New York; Dr. Chevalier Jackson, Philadelphia;
Dr. M. D. Lederman, New York; Dr. Harris P. Mosher, Boston; Dr. Francis
R. Packard, Philadelphia; Dr. W. A. Wells, Washington, D. C.; Dr. D. J.
Gibb Wishart, Toronto; Dr. Sidney Yankauer, New York; Dr. Max A.
Goldstein, St. Louis.

Regrets and congratulatory greetings were received from Dr. Albert
A. Gray of Glasgow, Dr. Thomas Guthrie of Liverpool, Professor F.
Lasagna of Parma, Italy, Dr. W. Scheppegrell of New Orleans, and Sir
St. Clair Thomson of London.

The collaborators in attendance individually expressed their felicitations
and plans were discussed for the future of THE LARYNGOSCOPE.

Dr. J. C. Beck read the following note:

"Please extend my warmest congratulations to Dr. Goldstein on the
occasion of the Twenty-fifth Anniversary of THE LARYNGOSCOPE.

"It is indeed remarkable that a journal remains in the hands of its
founder for all these years and it is with great pleasure that I wish him
many more years of continued successes.

"For all that THE LARYNGOSCOPE has done for American Oto-Laryngology,
Dr. Goldstein is deserving of the highest praise.

"Th's journal is an honor to America.

"Faithfully yours,

EMIL MAYER."

Edinburgh, May 11, 1921.

Dear Dr. Goldstein:

I must congratulate you very heartily on the Twenty-fifth Anniversary
of publication of THE LARYNGOSCOPE, and also on the fact that you have
occupied the editorial chair during this period.

With kind regards,

Yours sincerely,

J. S. FRASER, Editor,

Journal of Laryngology and Otology.

Paris, France.

Dear Dr. Goldstein:

Heartiest congratulations to the Twenty-fifth Anniversary of THE
LARYNGOSCOPE and best remembrances.

Faithfully yours,

HENRI LUC.

Great Missenden, Buckinghamshire, England, Feb. 23, 1921.

Dear Goldstein:

Owing to my physical ill-health for nearly two years, I must regretfully decline your very kind invitation to contribute "Laryngeal Reminiscences" to the Twenty-fifth Anniversary Number of THE LARYNGOSCOPE. I fear that I am not in a condition to make the effort. Would not some "Aphorisms" do as well as the title selected for my contribution? These I would gladly give you. As a fellow editor, I can sympathize with you for your labors of a quarter of a century and can congratulate you honestly on your accomplishments.

With love from us both to Mrs. Goldstein and to you,

Yours very sincerely,

FELIX SEMON.

Vienna, Austria.

Heartiest congratulations, my dear colleague, to the Twenty-fifth Anniversary of your esteemed journal and on your splendid and efficient editorial management throughout this period.

With most cordial greetings,

Sincerely,

VICTOR URBANTSCHITSCH.

Upsala, Sweden.

Heartiest congratulations to the forthcoming Twenty-fifth Anniversary of THE LARYNGOSCOPE and its editor.

With best wishes,

Yours faithfully,

R. BARANY.

Bordeaux, France.

I accept with pleasure your kind invitation to contribute an article, "The Recent Advances in the Surgery of the Accessory Sinuses," to the Twenty-fifth Anniversary Number of THE LARYNGOSCOPE.

With congratulations and best wishes,

Devotedly yours,

E. J. MOURE, Editor.

Revue Hebdomadaire de Laryngologie, D'Otologie et de Rhinologie.

